MONTHLY WEATHER REVIEW.

INTRODUCTION.

The MONTHLY WEATHER REVIEW for August, 1902, is based on reports from about 3,100 stations furnished by employees and voluntary observers, classified as follows: Regular stations of the Weather Bureau, 160; West Indian service stations, 17; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,562; Army post hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Government Survey, 75; Canadian Meteorological Service, 33; Jamaica Weather Office, 130; Mexican Telegraph Service, 20; Mexican voluntary stations, 7; Mexican Telegraph Company, 3; Costa Rican Service, 7. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander W. H. H. Southerland, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San José, Costa Rica; Capt. François S. Chaves, Director of the Meteorological Observatory, Ponta Delgâda, St. Michaels, Azores; W. M. Shaw, Esq., Secretary, Meteorological Office, London; and Rev. Josef Algué, S. J., Director, Philippine Weather Service.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30', or $10^h 30^m$ west of Greenwich. The Costa Rican standard of time is that of San José, $0^h 36^m 13^s$ slower than seventy-fifth meridian time, corresponding to $5^h 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.
By Prof. E. B. GARRIOTT, in charge of Forecast Division.

In its general character the weather of August, 1902, corresponded with that of the preceding month. Moderate temperatures and frequent rains prevailed in the Northern States, and continued dry and warm weather in the middle and west Gulf States. West of the Rocky Mountains the first decade of the month was warm, the second decade cool, and after the 20th temperatures averaged about normal. In the Plateau and Pacific coast districts dry weather prevailed, except in New Mexico and Arizona, where frequent showers were reported. No severe general storms occurred on the coasts or the Great Lakes, nor in the West Indies.

Special warnings to vessels eastward bound from American ports were not required. On the 13th a disturbance of moderate strength moved eastward over Newfoundland, and during the succeeding forty-eight hours the barometer fell rapidly over the North Atlantic Ocean as far south as the Azores. On the morning of the 16th reports from the west coast of Ireland indicated the approach of a disturbance from the west. During the 17th and 18th this disturbance increased in intensity, and by the 19th had apparently crossed the British Isles to the North Sea. The severest disturbance of the month over the western Atlantic crossed Newfoundland from the southwest on the 17th, and apparently passed thence far to the north of the steamer routes. During the closing days of the month the barometer was low over the British Isles and western Europe.

BOSTON FORECAST DISTRICT.

No storm warnings were issued during the month and no storms or destructive winds passed over the district. The weather of the month was characteristic of the season and uneventful.—*J. W. Smith, Forecast Official.*

CHICAGO FORECAST DISTRICT.

In this district the month was not characterized by any unusual atmospheric disturbances, and no severe storms occurred on the upper lakes.—*H. J. Cox, Professor.*

NEW ORLEANS FORECAST DISTRICT.

No general storms occurred in this district during the month, and no special warnings were issued.—*I. M. Cline, Forecast Official.*

DENVER FORECAST DISTRICT.

No special warnings were issued during August.—*F. H. Brandenburg, Forecast Official.*

SAN FRANCISCO FORECAST DISTRICT.

The month was unmarked by any noteworthy disturbance.—*A. G. McAdie, Professor.*

PORTLAND, OREG., FORECAST DISTRICT.

The month was, as a whole, uneventful, and no storm warn-

ings were issued. Light frost occurred in eastern Oregon and in southwestern Idaho on the morning of the 29th. Warnings of this frost were issued on the morning of the 28th.— *E. A. Beals, Forecast Official.*

RIVERS AND FLOODS.

The rivers fell generally during August, the lowest stages for the month occurring almost uniformly during the last two or three days. There was, however, ample water for navigation except above Cincinnati, Ohio, where low stages caused a suspension after the 22d.

The crest of the Brazos River flood passed Booth, Tex., on the 8th, with a maximum stage of 38 feet, one foot below the danger line. This flood was described in the WEATHER REVIEW for July, 1902. There was no other high water except locally in the Wateree River in South Carolina on the 15th and 16th, where heavy showers caused a 20-foot rise that disappeared as rapidly as it came.

The highest and lowest water, mean stage, and monthly range at 142 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Memphis, Vicksburg and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocity.	
	Date.*	Lat. N.	Long. W.	Date.*	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	1, p. m..	50	120	3, p. m..	47	87	1,600	2.0	800	33.3
II	4, a. m..	53	122	7, a. m..	37	98	2,050	3.0	683	28.4
III	9, a. m..	53	122	13, p. m..	39	75	2,900	4.5	644	26.8
IV	13, a. m..	50	100	17, a. m..	39	82	1,450	4.0	362	15.0
V	18, p. m..	48	125	25, a. m..	38	80	2,950	6.5	454	19.0
VI	25, a. m..	50	108	30, p. m..	37	75	2,700	5.5	491	20.4
Sums							13,650	25.5	3,434	142.9
Mean of 6 paths							2,275		572	23.8
Mean of 25.5 days									535	22.3
Low areas.										
I	1, a. m..	51	114	4, a. m..	43	71	2,400	3.0	800	33.3
II	2, p. m..	34	113	7, a. m..	48	68	3,050	4.5	678	28.2
III	6, a. m..	53	105	7, p. m..	49	86	1,000	1.5	667	27.8
IV	7, p. m..	54	114	12, p. m..	46	60	2,600	5.0	520	21.7
V	8, p. m..	44	103	10, a. m..	35	97	825	1.5	550	22.9
VI	10, p. m..	50	120	13, p. m..	38	105	2,250	3.0	750	31.3
VII	16, a. m..	41	112	18, a. m..	37	100	1,400	2.0	700	29.2
VIII	23, p. m..	51	114	25, p. m..	37	100	1,600	2.0	800	33.3
Sums							15,125	22.5	5,465	227.7
Mean of 8 paths							1,891		683	28.5
Mean of 22.5 days									672	28.0

*The "a. m." and "p. m." refer to the regular 8 a. m. and 8 p. m. weather maps.

For graphic presentation of the movements of these highs and lows see Charts I and II.—*Geo. E. Hunt, Chief Clerk Forecast Division.*

CLIMATE AND CROP SERVICE.
By JAMES BERRY, Chief of Climate and Crop Service Division.

The following summaries relating to the general weather and crop conditions during August are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau:

Alabama.—The month, as a whole, was hot, dry, and generally unfavorable for all growing crops, though fairly good and beneficial rains fell during the first few days, and very general rains during the last few days relieved the long-protracted drought, the rainfall being excessive in a few places. Cotton deteriorated steadily and promises the poorest yield in years; corn promises a poor yield and minor crops poor to fair only.—*F. P. Chaffee.*

Arizona.—General rains occurred in the early part of the month and languishing vegetation was revived. The rains continued intermittently throughout the month, and the soil was well soaked in many localities. In sections where a total crop failure was apprehended a harvest will be made.—*William G. Burns.*

Arkansas.—At the close of the month cotton had deteriorated to such an extent that many correspondents estimated the yield at from half to two-thirds of a crop. Early corn made a good crop in central and southern portions of the State, but late corn was greatly injured by drought in the northern counties. There were many complaints of its drying up, and much of it was cut to save the fodder.—*E. B. Richards.*

California.—Temperature slightly below normal during the month retarded the ripening of grapes and late deciduous fruits to some extent. Field and forest fires caused considerable damage in the northern section. Grain harvest and haying were nearly completed at close of the month. Wheat, oats, barley, and hay yielded large crops. Deciduous fruits were above the average yield and a heavy crop of grapes was expected.—*Alexander G. McAdie.*

Colorado.—The rainfall was not only unevenly distributed, but it also came too late to effect a material improvement in the condition of those crops which were suffering from the protracted drought and scarcity of water. The ranges in the south-central sections, however, were revived by the copious precipitation of the last decade and gave promise of good fall pasturage at least. The conditions as regards moisture were less favorable in the northern counties, and as only a few of the very old ditches in the north-central section were supplied with water for irrigation, corn, potatoes, and other late crops continued to deteriorate. Harvesting and thrashing of grain crops were prosecuted under favorable conditions. In a few localities only was a third crop of alfalfa obtained. Fruit made normal advancement, and a large crop of good quality was marketed.—*F. H. Brandenburg.*

Florida.—High midday temperatures and ample sunshine stimulated the opening of cotton, which at the close of the month was from half to two-thirds open, and the crop was about half picked. The warm, frequent showers benefited cane and late cotton. The citrus fruit crop will be much reduced. The prospect for sweet potatoes is poor, dry weather causing a reduced acreage. Seeding for fall and winter gardens is backward.—*A. J. Mitchell.*

Georgia.—Drought conditions which prevailed at the close of July were intensified, and continued until about the close of the month, when general rains fell. Cotton suffered from rust and premature opening, and steadily deteriorated during the latter half of the month. The rains at the close of the month were too late to be of much benefit and badly discolored the staple. A short yield was in prospect, with little or no second growth visible.—*J. B. Marbury.*

Idaho.—While there were no storms of great severity during the month, the weather was showery in the northern counties from the 15th to 18th and in the southern sections from the 12th to 16th. The showers were followed by quite general frosts on the 18th and 19th, causing slight injury to tender vegetation. Light frosts occurred nightly in elevated sections from the 26th to the close of the month.—*S. M. Blandford.*

Illinois.—Rainy weather prevailed over most of the State during a large part of the month. In the middle and northern portions the rains caused considerable damage to grain in shock, but in the southern portion, where the weather had previously been rather dry and where thrashing was nearly completed, the rains were beneficial. The cool and wet weather of the month caused corn to mature very slowly, though a large crop of it was being made. In the southern district there was a decided improvement in the crop. During the latter part of the month corn matured more rapidly. Grasses, gardens, and potatoes did well during the month and at the end of the month pastures were in good condition. The apple prospects improved during August. The fruit dropped less than previously and there was considerable improvement in its quality.—*M. E. Blystone.*

Indiana.—With the exception of that in the north section and very late plantings in other places, the corn crop was unusually promising and much of it was cut and shocked. During the last half of August cutting corn, digging potatoes, cutting and thrashing clover, canning tomatoes, gathering pears, cutting tobacco, and plowing for fall seeding was in progress; potatoes were yielding an exceptionally heavy crop; fruit was of good quality, but ripened slowly; pears and grapes were good to fair; apple trees, with the exception of a comparatively few orchards, were bearing a very light crop of fruit; pastures were generally good—*W. T. Blythe.*

Iowa.—August was excessively wet, cool, and cloudy, the average rainfall being more than double the normal amount. The conditions were unfavorable for harvesting and thrashing, and the damage to oats, wheat, rye, and barley, exposed to the weather in shocks, was very heavy. A large percentage of oats were entirely ruined and all grain crops suffered heavily: Corn became very rank and was heavily eared, but at the close of the month was ten to fifteen days later than usual. The minor crops and vegetables made heavy growth.—*John R. Sage.*

Kansas.—Warm, wet month, improving late corn, apples, forage crops, and pastures. Wet weather stopped haying, plowing, alfalfa cutting and thrashing, injured potatoes in ground, and caused wheat, oats, and flax to sprout in stacks. Much early corn cut, some marketed and some being fed. Prairie haying progressed where possible and a fine crop of fine hay was put up.—*T. B. Jennings.*

Kentucky.—The rainfall was very unevenly distributed and was deficient in most sections, consequently vegetation suffered in many localities. The condition of the corn crop at the close of August was not quite as good as it was at the close of July. It improved in some localities in the southern and extreme western counties, but deteriorated in many of the northern and eastern counties. Very nearly an average yield was promised, however. Much of the early crop was cut. Tobacco improved slightly in some of the western counties and about held its own in the Burley district. It will not be a full crop. Cutting and housing was progressing under favorable conditions. A good crop of hemp was cut. Pastures suffered for rain. Second crops of hay were light. Minor crops, gardens, and trucks were fairly good in some sections; very poor in others. Plowing for winter grains progressed where condition of soil permitted, and some oats were sown.—*H. B. Hersey.*

Louisiana.—The cotton crop was not doing well at the opening of the month and excepting some beneficial weather during the first and second decades, no material improvement resulted during August; rust damaged the crop in many parts of the State; many complaints of shedding were received; the bulk of early cotton was open by the close of the month, but the unusually hot weather interfered with outdoor work and picking progressed slowly; the crop was generally below an average and in some places was very poor. The weather of the month was generally favorable for sugar cane and a rapid and healthy growth resulted. Late rice showed much improvement; the bulk of early rice was housed in good condition. The best yield of rice was in the parishes bordering on the river.—*I. M. Cline.*

Maryland and Delaware.—August temperatures were moderate and pleasant. There were no hot waves. The rainfall was but little more than half the normal amount. The moisture was sufficient in limited districts, but for the section at large conditions of semidrought prevailed, with untoward effects on all crops. Early corn withstood the dry weather well, but the late corn was hurt; fodder saving made good progress, and some corn was cut toward the end of the month. Wheat thrashing continued. Oats were harvested in the west, with fine yields. Buckwheat fared well. Pastures were generally poor. Early tobacco was largely saved in good condition, but the yields were light; late tobacco suffered for rain. Peaches and pears were fair to good in places, poor in others, while apples were generally scarce. Tomatoes were of good quality, but the output was lighter than expected. Potatoes varied from poor to very good, but in general were above average. Fall plowing was delayed by the hard soil. Gardens suffered somewhat, and fall patches of turnips and late cabbages were hurt by the dry weather.—*E. C. Easton.*

Michigan.—The generally dry, cool weather which prevailed during most of August was favorable for the completion of wheat and rye harvests and haying, which had been greatly delayed by the excessive rainfall of July. Wheat, rye, barley, and hay were quite generally secured by the 10th, and oat harvest had begun in most counties of the lower peninsula. Oats, although considerably lodged, matured finely and were well secured by the 20th; the crop was a good one. The cool, dry weather was not favorable to the growth of corn, which continued backward during the entire month. Potatoes and beans improved somewhat until about the 15th, after which they made little progress, especially potatoes, which at the close of August showed considerable blight and were much in need of rain. Sugar beets made good progress throughout the month and at its close were in a promising condition; buckwheat filled nicely and was nearly ripe. The dry condition of the soil made fall plowing slow and the lack of rainfall considerably retarded that work; at the close of the month the soil was quite dry and hard and when plowed turned up very lumpy. Several light frosts occurred during the month, but the damage resulting was generally quite light. Fruit continued to do well and the yields of early peaches and apples were fairly good, while the prospects for pears, late peaches, and winter apples were good.—*C. F. Schneider.*

Minnesota.—Local storms with their attendant heavy rains and high winds lodged large areas of grain, which made harvest difficult and slow. The harvest of early barley and oats had reached the northern boundary by the first of the month, and spring wheat cutting had extended to the central portions of the State, while in southern portions all the barley was cut, and oat and spring wheat harvest was well advanced. The harvesting of all these crops advanced northward during the month, so that by the end of the month half to two-thirds of the spring wheat was cut

in the extreme north, and all the barley and oats, except the latest, and flax cutting was generally well advanced in all sections. Stacking and thrashing from the shock followed harvest as rapidly as possible. Corn grew well in the early part of the month, but the weather in the latter part was too cool and damp for the most favorable ripening conditions.—*T. S. Outram.*

Mississippi.—The hot, dry weather during the middle of the month damaged cotton and early corn in the middle and southern counties very seriously. Late crops were revived by general rains on the 28th and 29th. Cotton opened very rapidly, much of it prematurely, and by the end of the month picking was well advanced. The general outlook for cotton was for less than an average yield.—*J. M. Kirk.*

Missouri.—Over the greater portion of the State the month was cool and showery, and in many of the northern and western counties there was much more rainfall than was needed. Drought continued in the southeastern counties until the 26th, when heavy showers were general over that section. The ripening of early corn was somewhat retarded by the cool, showery weather, but otherwise the crop continued in excellent condition, except in a few southeastern counties, where late corn was considerably injured by drought. Pastures were excellent, as a rule, and all late forage crops made a heavy growth. Thrashing was considerably retarded by rains during the latter half of the month and much further damage was done to grain in stack. Plowing for fall seeding was considerably delayed in the southern sections during the fore part of the month by the dryness of the ground, while during the latter part the soil in some of the northern and western counties was too wet.—*A. E. Hackett.*

Montana.—Haying was carried to completion and a heavy crop obtained. Grain began to ripen during the early days of the month; at the close of the month harvesting was practically completed and thrashing was progressing generally; the grain yield was proving fair to good, and in some localities excellent. The early potato crop is good, but the late is not promising. The Flathead County apple crop promises an unusually large yield. Cutting of second crop of alfalfa began latter part of month, with encouraging prospects.—*Montrose W. Hayes.*

Nebraska.—The rainfall was deficient in the southern part of the State during the first half of the month and in a few southwestern counties corn was damaged by lack of moisture. The area affected, however, was small. With this exception the rainfall exceeded the normal, and corn made a vigorous growth, but did not ripen as fast as usual. The stalks are large, with an unusually large number of well-filled ears. Haying and thrashing were retarded by moisture most of the month and some damage resulted to both hay and grain. Pastures were exceptionally fine.—*G. A. Loveland.*

Nevada.—The weather of the month was slightly cooler and drier than usual. Conditions were very favorable for harvesting operations and the maturing of large crops. Pasturage was fairly good in most sections and live stock continued in excellent condition. Crops under proper irrigation made satisfactory growth and at the close of the month looked promising. Haying was practically finished at the end of the month and a good crop was cut and saved without damage. The harvesting of grain was in active progress throughout the month; considerable thrashing had been done when the month closed, the yield being about average.—*J. H. Smith.*

New England.—The weather of the month has been generally favorable for the growth and harvesting of crops and for farm work. The low temperature has been unfavorable for corn, which is practically a failure. The second crop of grass is heavy and has been secured in good condition. Apples and peaches are a good crop, except winter varieties of apples, which are a failure. A large crop of tobacco of excellent quality has been secured.—*T. L. Bridges.*

New Jersey.—The prevailing weather conditions were generally unfavorable; cool nights retarded the maturing of corn and tender vegetation. Thunderstorms were quite frequent during the month and very destructive on the 10th and 21st. On these dates damage to the amount of $150,000 was done to buildings and crops in the vicinity of Trenton, Mercer County.—*Edward W. McGann.*

New Mexico.—The drought existing in a more or less degree during the entire growing season over all sections, excepting the extreme southeast, was broken early in August by good, general showers. Range grass started rapidly, and by the close of the month good fall and winter feed for stock was generally assured, excepting on some northern and northeastern ranges. Corn and the later growths of alfalfa, melons, and late fruits were greatly benefited. Late peaches, apples, pears, and plums ripening in particular excellence.—*R. M. Hardinge.*

New York.—Heavy rains with gales and destructive hail occurred in places on the 3d, and showers were frequent until the 11th, after which it was generally dry. Rains damaged wheat, rye, oats, hay, potatoes, corn, and beans. The weather after the 11th was generally favorable for farm operations excepting fall plowing, which was delayed by the dry condition of soil. Potatoes suffered a marked decline, and corn and beans were very poor, while the condition of buckwheat was improved. The yield of wheat, rye, barley, and hay was good, while the crop of oats was very fine. Pears, peaches, and grapes promised to be light, and grape rot was reported. Apples were decidedly variable, the outlook generally pointing to a supply smaller than the average. Hops appeared

to be light and inferior, and tobacco less than the average crop. Pastures continued in good condition.—*R. G. Allen.*

North Carolina.—During the greater part of August weather conditions were generally favorable for the growth of crops, except that there were more local storms with damage by wind and hail over limited areas than at any previous time during the season. While showers were frequent there were many counties in which drought prevailed, and in consequence there was a slight deterioration in many crops. The rainfall was deficient and very irregularly distributed, and during the last decade drought prevailed everywhere. Old corn suffered much from the drought, but late planted remained very promising. Curing tobacco progressed very rapidly with excellent results. Early upland cotton began to open during the first decade, and soon the crop was opening generally, with picking underway. Minor crops did fairly well.—*C. F. von Herrmann*

North Dakota.—The month was, as a rule, unfavorable for harvesting, frequent rains retarding work and also causing some early cut grain to sprout in the shock, while high winds were detrimental to stacking and haying. Cool, damp weather also kept grain from maturing, and at the close of the month most of the late sown grain and all corn was still green. Light frost on the 11th did some damage to crops.—*B. H. Bronson.*

Ohio.—First half of the month was showery and the last half cool, with but little rain. Corn is generally promising, except in extreme northeast; in the southwest late corn is injured some by drought; early corn is ripening and cutting has commenced. Tobacco good and being secured in good condition. Clover seed and grapes fair. Apples are a little more promising at close of month. Plowing progressing.—*B. L. Waldron.*

Oklahoma and Indian Territories.—The month was generally hot and dry with occasional hot winds which were damaging to fall crops; cotton bolled and fruited well, but soon deteriorated under the combined influence of hot winds and boll worms, giving prospects for not more than half crop; the middle and top crops were most affected, the bolls opened prematurely or dropped off; picking was in progress by the 11th. Corn was cut with fair to good yields, while late corn was much affected by the hot winds; broom and kaffir corn, cane, castor beans, millet, and alfalfa were secured with fair to good yields. Plowing for fall wheat progressed slowly, but the ground was ready to seed by the close of the month. Grass continued in good condition, water was plentiful, and stock was generally in good condition; haying progressed during the month. Late potatoes and turnips were sown. Late fruit, especially the peach crop, was seriously injured by the hot winds and dried or withered on the trees.—*C. M. Strong.*

Oregon.—The weather during the month was very favorable for harvesting the grain crop, which was secured in excellent condition. The crop was probably an average one, notwithstanding that in many sections the yields were less than expected. Hops and corn made excellent advancement. Potatoes did fairly well, but they would have been more thrifty and promising if the weather had not been so dry. Potato blight affected the crop to a considerable extent in the coast counties. Sugar beets and field onions did well. Early apples and peaches were plentiful in the markets by the end of the month.—*Edward A. Beals.*

Pennsylvania.—Showers were general in nearly all districts during the first decade, but after the 11th the rainfall was light and scattered and drought conditions prevailed in many localities. Light frost was recorded in the more elevated districts during the last decade. Oats and clover made good progress and the yield was generally satisfactory. Pastures furnished ample feed, but were in need of moisture at the close of the month. Garden truck was plentiful. Buckwheat developed nicely and a good crop seems assured. A large acreage of corn is backward and some fields will be cut for fodder and others are in danger of damage by early frost. Tobacco plants are late but generally thrifty. Potatoes are good size but small crop, and complaints of injury by rot and blight are numerous. Fruit ranges from good in some sections to a failure in others, and as a whole the crop will probably be below normal.—*T. F. Townsend.*

Porto Rico.—Farming operations delayed and plant growth and development checked by serious drought. Sugar making discontinued, owing to the lateness of the season. Young canes did well until toward the end of the month, when they, too, began to show signs of suffering. Planting for gran cultura commenced. A promising coffee crop is now about ready for the picker. The picking has commenced in the southern part of the coffee district. Some seeds have been sown and other preparatory work done for a new tobacco crop. Some corn gathered during the month; late corn injured by the drought. Rice crop seriously damaged; in some places it is a total loss. The usual preparations for minor crops have been made as far as practicable. Pineapples, alligator pears, mangoes, bananas, and other fruits plentiful. Pasturage becoming short.—*E. C. Thompson.*

South Carolina.—Neither the deficiency in temperature nor in precipitation affected the favorable progress and development of most of the growing crops, although cotton deteriorated steadily, due to rust that caused the plants to shed their leaves, squares, and young bolls. Cotton opened early and rapidly, and picking was well under way by the close of the month. Corn became very promising, and all other crops made satisfactory progress.—*J. W. Bauer.*

South Dakota.—Generally favorable weather attended the harvesting

of spring wheat, oats, barley, and speltz, which work was completed by the 25th, with promising outlook for very good yields and quality of grain, but frequent rains in the third decade retarded stacking and thrashing from shock, and in the middle-eastern and southeastern counties damaged some grain in shock. Corn continued backward throughout the month. Frost on the 11th injured considerable corn, principally the late planted, in parts of a number of middle-eastern and northeastern counties, some fields irreparably, and also some millet, flax, and late potatoes. At the close of the month the corn outlook was poor to fair in the localities where affected by the frost, and elsewhere generally fair to very good, but the crop was greatly in need of warm, dry weather; early flax was good and mostly cut, late flax poor and some yet green; early potatoes were matured, a good crop; late potatoes only fair; the bulk of a large hay crop was secured; pastures were good and live stock in fine condition; hail did some damage locally to corn, flax, millet, and gardens.—*S. W. Glenn.*

Tennessee.—The rainfall was generally insufficient for the needs of growing and maturing crops, and early corn was generally much reduced in prospective yield. Late corn held up well and promised fair to good yields. The outlook for cotton had been very encouraging and was still fairly good at the end of the month, though rust and shedding had caused considerable deterioration in many fields; it was opening rapidly and picking was in general progress by September 1. Tobacco was generally in fair condition, but below the average in some of the largest producing districts. All late crops suffered from lack of moisture, except in a few localities.—*H. C. Bate.*

Texas.—The month began with highly favorable weather conditions and all crops were generally in good condition. The excessively high temperatures that prevailed throughout the month, which was the driest in the history of the Texas weather service, caused a marked deterioration in all crops. Cotton especially failed rapidly as the month advanced, and by its close the bright prospects for a full crop that obtained in July had given place to extreme disappointment. Cotton picking progressed rapidly throughout the month, with yields generally unsatisfactory. Boll worms and weevil were unusually destructive, but these insects began diminishing during the last decade of the month. The gathering of early planted corn was well under way by the close of the month, but the yield was very short. Sugar cane and rice promised excellent crops, but suffered to some extent from the prevailing hot and dry weather. June corn and all minor crops did fairly well, but showed at the close of the month the need of rain.—*Edward H. Bowie.*

Utah.—Heavy frost occurred in the elevated valleys of the north-central portion of the State on the mornings of the 22d and 31st, doing some damage to spring grain, potatoes, and other tender plants. With this exception, the temperature conditions of the month were favorable to growing crops. Good showers fell over the southern section, but the rainfall over the rest of the State was too light to be of any service.—*L. H. Murdoch.*

Virginia.—The condition of the weather throughout the month as affecting crops was in the main highly favorable. The rainfall, though below normal, was frequent and very well distributed, except in portions of the valley division. Fine crops of corn and tobacco are promised. Fall work is progressing favorably, except in the dry part of the valley district.—*Edward A. Evans.*

Washington.—The weather was for the most part warm and clear and exceptionally favorable for harvesting. Hot winds during the first decade shriveled a small amount of wheat and oats and had an unfavorable effect upon potatoes. Drought injured pastures, which were somewhat freshened by rains on the 15th, 16th, and 17th. Frosts in exposed localities on the 27th injured tender vines.—*G. N. Salisbury.*

West Virginia.—August was rather a dry, cool month with conditions generally favorable for crops, and for the completion of harvesting. During the third week oats were mostly in stack, with above an average yield; thrashing of wheat, rye, and oats was in full progress, and haying was completed with about half a crop. At the close of the month, early corn was maturing nicely, and a good crop was assured; late corn had been improved by the showers, and the prospects were quite promising; fall grass and pastures were also improved, and stock was in very good condition; buckwheat sowing had been completed, and it was growing finely; Irish potatoes had been mostly dug, with a large yield, and sweet potatoes were doing well; some little plowing had been done, but the ground was generally too hard and dry; water was getting scarce, and more rain was badly needed both for crops and the soil.—*E. C. Vose.*

Wisconsin.—The month was cool throughout, with light frosts in exposed localities in the central counties on the 12th and killing frosts in the northeastern section on the 22d and 23d. There was, however, no material damage except to tender garden vegetation. The distribution of rainfall was very uneven, ranging from over six inches over the west-central counties to less than half an inch in portions of the southern section. The soil was very dry and plowing difficult until near the end of the month, when a generous rainfall occurred in the central and northern sections. Corn made very slow progress and at the end of the month still needed two weeks of good weather to mature the crop. A large crop of second growth clover was secured in good condition. Apples improved greatly during the month and gave promise of a large crop of excellent

quality. Cranberries made excellent progress and at the end of the month were nearing maturity; the yield promises to be large and the quality excellent.—*W. M. Wilson*.

Wyoming.—On the whole the month was unfavorable for growing crops and range lands. It was abnormally dry and practically amounted to a drought. Weather was very favorable for haying, but so damaging to ranges that no grass was left at end of month. Prospect for winter feed is bad in sections. Alfalfa and native hay crop all in, with average yield for State as a whole. Grain ripened slowly on account of cold nights, but harvest was in general progress. Small crops and gardens did well where water was sufficient for irrigation. Frosts and grasshoppers did some damage. Stock in good condition.—*Charles E. Ashcraft, Jr.*

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings:

Summary of temperature and precipitation by sections, August, 1902.

Section.	Section average.	Departure from the normal.	Station. (Highest)	Highest.	Date.	Station. (Lowest)	Lowest.	Date.	Section average.	Departure from the normal.	Station. (Greatest monthly)	Amount.	Station. (Least monthly)	Amount.
Alabama	82.1	+2.5	Newberne	107	20	Hamilton	52	25	3.48	—1.00	Bermuda	11.09	Letohachee	0.59
Arizona	81.4	—0.3	Casagrande	119	5	Ashfork	35	31	1.94	—0.13	Flagstaff	6.10	Several stations	0.00
Arkansas	80.6	+1.0	Arkadelphia	108	4	Pond	51	7	2.55	—0.56	Corning	7.54	Perry	0.00
California	71.8	—1.6	Salton, Volcano	121	1	Bodie	17	16	0.06	.00	Sisson	4.16	Many stations	0.00
Colorado	67.1	0.0	Blaine	111	4	Breckenridge	23	8	1.84	+0.19	Cheyenne Wells	6.06	Pagoda	T.
Florida	82.1	+0.7	Wausau	105	21	Macclenny, Sumner	57	26	4.60	—2.89	Molino	9.13	Quincy	0.92
Georgia	80.3	+1.3	Brent	106	21	Clayton	55	31	3.92	—2.18	Harrison	11.11	Camak	0.90
Idaho	66.5	—0.8	Garnet	105	2	Forney	21	18	0.45	—0.22	Pollock	1.32	Blackfoot, Oakley	0.00
Illinois	71.8	—2.4	Equality	102	2	Chemung	41	12	4.59	+1.30	Urbana	9.79	Antioch	0.55
			Hallidayboro		14									
Indiana	74.1	—2.6	Madison	100	19	Winamac	40	12, 23	2.24	—0.82	Rockville	5.36	Vevay	0.70
			Mount Vernon		2, 3									
Iowa	69.1	—2.0	Perry	98	19	Sibley	37	11	6.58	+3.51	Columbus Junction	15.47	Dubuque	1.57
Kansas	78.2	+1.0	Garden	112	20	Achilles	40	11	5.89	+2.77	Moran	14.36	Lakin	0.34
Kentucky	75.6	—0.9	Bowling Green	103	3	Fords Ferry	45	12	2.48	—0.70	Blandville	5.70	Scott	0.86
Louisiana	84.1	+2.9	Alexandria	107	17	Mansfield	61	13	3.47	—1.76	Schriever	9.69	Mansfield, shreveport	0.02
Maryland and Delaware	71.7	—2.7	Hancock, Md	100	31	Deerpark, Md	53	17	2.07	—1.83	Baltimore, Md	4.31	Jewell, Md	0.87
Michigan	64.2	—2.1	Kalamazoo	95	3	Newberry	29	29	1.53	—1.13	Port Huron	4.05	Somerset	T.
Minnesota	65.2	—3.0	Milan	96	1	Beardsley, Pipestone	32	11	4.35	+1.00	Pipestone	10.69	Collegeville	1.32
Mississippi	82.7	+2.5	Pittsboro	107	20	Corinth	54	25	3.77	—0.58	Lake Como	7.53	Thornton	0.50
Missouri	75.0	—1.1	Marblehill	103	3	6 stations	47	7, 11	6.18	+3.28	Arthur	11.49	Galena	0.96
Montana	63.1	—1.1	Glendive	102	24	Adel	25	30	0.86	+0.03	Glendive	2.50	Manhattan	0.00
Nebraska	71.9	—1.1	Bridgeport	107	1	Lynch	35	11	3.25	+0.61	Kirkwood	8.74	Agate	0.22
						Calloway		31						
Nevada	68.9	—3.1	Rioville	117	2	Monitor Mill	30	17	0.22	—0.13	Palmetto	2.13	Several stations	0.00
						Wood		18						
New England	64.8	—2.3	Berlin Mills, N. H.	92	30	Fort Fairfield, Me	30	17	3.58	—0.62	Cornish, Me	8.36	Nantucket, Mass	0.27
New Jersey	70.1	—2.4	Salem	93	4	Layton	40	13, 17	3.91	—0.30	Trenton	10.67	Canton	1.31
			Indian Mills		11									
New Mexico	71.3	+0.3	Alamagordo	105	5	Winsors	34	19	2.73	+0.71	Fort Bayard	7.13	Albuquerque	0.70
New York	65.0	—2.1	Oneonta	94	3	Axton	30	13	2.81	—0.99	Adirondack Lodge	6.05	Volusia	0.79
North Carolina	75.5	—0.5	Chapelhill	105	4	Linville	39	28	3.93	—1.92	Kinston	8.91	Lenoir	0.90
North Dakota	64.3	—1.2	4 stations	96	2, 13, 24	Ashley	26	11	2.30	+0.60	Berlin	5.21	Woodbridge	0.36
Ohio	69.2	—2.5	Camp Denison	97	3, 30	Norwalk	37	25	1.67	—1.23	Demos	5.86	Bowling Green	0.18
Oklahoma and Indian Territories	84.2	+3.1	Mangum, Okla	114	5	Kenton, Okla	50	5	2.19	—0.53	Tahlequah, Ind. T	6.14	Jenkins, Okla	0.31
Oregon	66.0	—0.6	Grants Pass	107	6	Bend	26	18, 28	0.35	—0.23	Jacksonville	1.97	Several stations	0.00
Pennsylvania	67.8	—2.0	Huntington	100	31	Irwin	34	17	2.62	—1.51	Ephrata	6.44	Erie	0.51
Porto Rico	80.0	0.0	Cayey	98	19	Cidra	55	1	5.18	—2.95	Morovis	9.65	Hacienda Amistad	2.40
South Carolina	78.6	—0.7	Heath Springs	104	22	Heath Springs	55	29	5.07	—1.11	Batesburg	8.68	Spartanburg	1.29
South Dakota	68.2	—3.0	Bowdle	101	1	Howard	26	11	3.72	+1.53	Flandreau	9.84	Fort Meade	0.07
Tennessee	77.0	+0.5	Springfield	104	14, 21	Erasmus	42	25	3.81	—0.18	Arlington	9.36	Springfield	1.00
Texas	86.1	+3.1	Cotulla	110	30	Amarillo	52	11	0.30	—2.24	Kent	3.70	49 stations	0.00
Utah	69.4	—1.0	Green River, Hite	110	2	Tropic	23	17	0.51	—0.30	Ranch	2.25	Promontory, Snowville	0.00
						Lou		31						
Virginia	72.9	—2.6	Saxe	100	10	Burkes Garden	38	24	2.85	—0.83	Saxe	5.40	Stanton	0.80
			Newport News		12									
Washington	64.6	—0.9	Mottingers Ranch	104	7	Wilbur	27	27	0.57	—0.16	Sedro-Wooley	2.27	Ellensb'g, Sunnyside	0.00
West Virginia	70.4	—2.6	Echo	98	30	Travellers Repose	35	17	2.40	—1.15	Leonard	5.90	Cuba	0.97
			New Martinsville		31									
Wisconsin	65.5	—2.4	Medford	99	1	Butternut	30	22	1.91	—1.03	Whitehall	7.18	Westfield	0.38
Wyoming	64.3	—1.3	Thermopolis	103	3	South Pass City	25	18	0.22	—0.56	Daniel	0.64	Hyattville, Thermopolis	0.00
						Lolabama		19						
						Kemmerer		31						

SPECIAL CONTRIBUTIONS.

OCEAN CURRENTS.

By JAMES PAGE, United States Hydrographic Office, dated October 18, 1902.

Every method of investigation thus far employed, whether the drift of floating objects, the comparison of the temperature and the specific gravity of specimens drawn from widely distant points, or the distribution of animal organisms inhabiting different localities, all lend support to the belief that the vast mass of water near the surface of the sea and to a very considerable depth below the surface, even at a distance of thousands of miles from the continental shores and hence far removed from local or tidal current influence, is in motion. The continuity of this motion in certain broad and well-defined regions, such as the Tropics, can not but impress us with the idea that it is in a general way cyclic, that is, that the same water after a lapse of time retraverses approximately the same path.

The source of the energy required to set and keep this vast mass in motion has been productive of endless discussion. The attractive force of the moon, the vis inertiæ or lag of the water itself, the difference in temperature and specific gravity of the equatorial and polar regions, the unequal distribution of atmospheric pressure, each in its turn has been proposed and strenuously advocated as the true and only cause of ocean currents. To the seaman, however, the cause of the ocean currents has always been the winds, since the motion of the waters of the sea takes its origin in the region where the latter attain their maximum constancy, viz, in the region of the trades.

The trade winds cover a belt on the earth's surface extend-

ing roughly over fifty degrees of latitude from 30° N. to 20° S., including within this range a greater water area than could be included in any other position. Throughout this wide zone the wind blows for 90 per cent of the time from some point in the eastern semicircle. In the Southern Hemisphere the trades are somewhat stronger and more constant than in the Northern, owing probably to the freedom from interrupting land areas. Over the eastern half of the ocean they extend far higher in latitude than over the western. This is true of both the northern and the southern hemispheres; the northeast trades in the Atlantic during the northern summer often extend far up on the coast of Spain, the southeast trades during the southern summer often extend beyond the Cape of Good Hope. Similar conditions hold for the Pacific. The southeast trades, too, blow well across the equator in the Northern Hemisphere.

The trade winds, however, are not continuous throughout the entire belt from north to south. Just north of the equator and confined entirely to the Northern Hemisphere are two elongated triangular areas extending east and west through some fifteen degrees of longitude; in the case of the Atlantic Ocean the base of the triangle rests on the coast of Africa; in the case of the Pacific, on the coasts of Central America and Mexico; throughout these areas the trades are absent, their places being taken during a large portion of the year by light, variable winds and calms, during the remainder of the year by winds whose prevailing direction is southwest—the so-called southwest monsoon of the African and American coasts, most apparent during July, August, and September.

THE CHARACTER OF THE TRADE WINDS.

Among those who have not sailed in them the impression is general that the trades blow day after day steadily in one direction and with a constant force. This is distinctly not the case. The trade winds are quite as susceptible to variation, and fortunately so, as the winds of higher latitudes. The one thing about them is that, not being subject to the large variations of barometric pressure which characterize higher latitudes, the wind rarely goes round the compass and, indeed, rarely gets out of the eastern semicircle. As an example of their constancy, let us consider the percentage of winds coming from each compass point for a certain region, for instance, the square bounded by the parallels 20°–25° N. and the meridians 50°–55° W., in the heart therefore of the northeast trades in the North Atlantic. The figures are for the month of June and may be regarded as giving the number of hours in each hundred, or approximately, in four days, that the wind may be expected to blow from the given point:

Direction and time.

N.	1
NNE.	3
NE.	17
ENE.	24
E.	33
ESE.	8
SE.	10
SSE.	4

Other squares show similar variations; some greater, some less.

THE IMPULSE COMMUNICATED BY THE WINDS TO THE SURFACE WATER.

Let us now examine the effect of such a system of winds in impelling through surface friction the water with which they come in contact.

If through any cause a thin layer of liquid is set in motion in its own plane with a given velocity, the layer immediately below it, and with which it is in contact, does not remain at rest, but likewise receives an impetus. This second layer exercises a like influence over the third, the third over the fourth,

and so on, the velocity ultimately attained by each successive layer being proportional to its distance from the bottom layer, which is supposed to be at rest. In the case of sea water the rapidity with which this velocity is propagated downward is very slight. It has been calculated, for instance, that a period of 239 years would elapse before a layer at a depth of 50 fathoms would attain a velocity equal to half that at the surface when the surface current is flowing steadily all this time. Such surface currents do not exist, neither do winds capable of producing them exist. The trades, as we have seen, fluctuate from day to day and, indeed, from hour to hour, and the surface currents fluctuate in obedience to them.

It has been stated, however, that the fluctuations of the trades rarely carry them out of the eastern semicircle, and that in point of fact 90 per cent of the winds that blow in the region of the trades do come from that semicircle. There is thus always a westerly component in the motion of the air, coupled with a component which is sometimes northerly, sometimes southerly. For each alteration in the direction of the wind there is a corresponding alteration in the direction of the surface current, the new direction being the resultant of the old direction and the direction which would be imparted to it by the new wind acting alone. These, however, affect only the waters immediately at the surface. Thus, to cite a specific example, observations at the Adlergrund lightship, in the Baltic Sea, have shown that while the water at the surface responds almost immediately to a change in the direction of the wind, the water at the depth of 2½ fathoms does not feel its effects until an interval of 24 hours has elapsed. The steady westerly component is then the only one felt in the region of the trades at some little depth below the surface, and this is sufficient to impart to the entire body of water occupying the equatorial regions of the earth, a westerly motion.

It is of some interest to note the velocity imparted to the surface water by winds of a given force. A comparison of a large number (658) of wind and current observations in the equatorial regions gave as the set imparted by a wind of force 4 on the Beaufort scale, corresponding to 20 miles per hour, a current velocity of 15 miles per day. The figures are taken from the Meteorological Data for Nine 10°-squares of the North Atlantic Ocean, published by the Meteorological Committee of the Royal Society.

The system of surface currents produced by such a system of winds as the trades has been experimentally studied, using for this purpose a minature ocean, the surface of the water being lightly sprinkled with powder in order to render its motion visible. As soon as the artificial wind was brought into action, a drift was created, and the first tendency was for the water to flow from all sides into the rear of the drift. This gradually extended itself in a sheaf-like form, the marginal threads in the fields untouched or only occasionally touched by the air current leaving the main body, first branching out to the right and left, then, reversing their motion, and finally again working round to the rear of the drift. The central portion of the drift followed a right-line course, in close agreement with the direction of the air currents, until a perpendicular obstacle was interposed. Here the drift divided into two streams, each flowing with the same velocity, but having half the cross section.

This experimental system of currents finds its counterpart in nature. Under the northeast trades in the North Atlantic and the southeast trades in the South Atlantic, we find a broad central drift directed toward the shores of America, the drift from the southeast trades extending well into the Northern Hemisphere, the two uniting some distance off Cape Saint Roque. To the right and to the left of each of these drifts the water fringes off, the direction of the motion is reversed, and the so-called compensating currents manifest themselves. Along the equatorial margin of the two main drifts, under the

equatorial belt of calms, these compensating currents unite to form the counter-equatorial current, or Guinea current, reaching a maximum intensity during June, July, and August, the months of the southwest monsoon. On the polar margin they either return into the drift or are taken up by the general easterly drift of the higher latitudes.

In the equatorial region of the earth we thus have in either ocean three currents. In the North Atlantic the north equatorial current, due to the northeast trades; in the South Atlantic the south equatorial current, due to the southeast trades; between these two the counter-equatorial current, flowing at all times, but reaching a maximum intensity and covering a maximum area at the time of the southwest monsoon. These first two are westbound, carrying the water toward the shores of America; the third is eastbound carrying toward the shores of Africa. They all suffer a slight displacement with the season, in harmony with the movements of the trades, which oscillate slightly in latitude with the movement of the sun in declination. Also in harmony with the fact that the meteorological equator lies slightly to the north of the geographical equator, the south equatorial current extends at all seasons well over into the Northern Hemisphere. Corresponding again with the fact that the southeast trades exhibit greater constancy and strength than the northeast, the south equatorial current shows higher velocity than the north, the average for the latter amounting to but 13 miles in twenty-four hours, for the former to 27 miles in twenty-four hours.

Similar statements hold for the Pacific Ocean. But from this point let us limit ourselves to the Atlantic, the currents for which are not only better known, but also probably better developed, being confined to a less extensive area than the Pacific.

In the Atlantic Ocean, then, the two drifts unite some distance off Cape Saint Roque, the eastern extremity of South America. A portion of the water is diverted to the southward forming the Brazilian current; the main body flows west-northwest along the coast of South America, some entering the Caribbean Sea by way of the passages separating the Windward Islands, the drift through these passages often attaining a velocity of 50 miles a day. The remainder passes to the northward of the islands, forming the Bahama current. In this neighborhood a series of observations by Admiral Irminger of the Danish navy showed that the westerly drift of the water could still be detected at a depth of 900 meters.

A striking instance of the fluctuations of the surface currents with the winds is shown in the case of the straits separating the Greater Antilles, the Windward, and the Mona passage. From January to April, the months when the northeast trades are most northerly in direction and blow with maximum force, a strong southwesterly set is felt upon entering these passages. As the season advances and the trades weaken, at the same time becoming southeasterly, these currents diminish and change their direction to northwest.

Throughout the entire extent of the Caribbean Sea the drift is westerly, save that in those portions where resistance to the flow is offered, such as the southern coast of Cuba, return currents manifest themselves. Throughout the Yucatan passage the drift is northwesterly, but here again the influence of the return current is felt, notably under Cape San Antonio, the western extremity of Cuba, where southeasterly sets are frequent. In the Gulf of Mexico observations have thus far failed to reveal any decided set of the surface water.

THE GULF STREAM.

Between the northern coast of Cuba and the Florida reefs starts the most celebrated of all ocean currents, the Gulf Stream. Discovered by Ponce de Leon in 1513, it has from that time been and still is the subject of scientific investigation.

In the Gulf Stream we have to deal with a current of a nature entirely distinct from those which we have thus far considered. These were all due to the direct action of the wind upon the water, producing a drift. The Gulf Stream is only indirectly due to this cause, being the overflow of the water heaped up by the trade-wind drift in the Caribbean Sea and the Gulf of Mexico. Throughout a considerable portion of its extent, its direction, even at the surface, is independent of the wind or only slightly modified by it. The stream reaches its maximum strength at the point where it emerges from the Bemini Straits between the Bahama bank on the east and the coast of Florida on the west. The breadth of the actual current here between Fowey Rocks and Gun Cay Light is 38 miles, 'its average depth 239 fathoms, its average velocity 50 miles in twenty-four hours, although it rises at times to 100 miles. Farther north its breadth increases, and its velocity is correspondingly diminished. The western edge of the stream in its northward course along the coast of the United States follows closely the 100-fathom curve, although the axis of the stream, the line of greatest velocity, lies somewhat farther seaward, its position varying, according to Pillsbury, with the declination of the moon, lying (at Jupiter) 8 miles farther off shore at time of low moon than at time of high. From Jupiter to Hatteras the axis runs at a distance varying from 11 to 20 miles outside the 100-fathom curve.

The color of the stream is a perceptibly deeper blue than that of the neighboring sea, this blueness forming one of the standard references of the nautical novelists. The depth of color is due to the higher percentage of salt contained, as compared with the cold green water of higher latitudes, observation having shown that the more salt held in solution by sea water the more intensely blue is its color. Thus even in extratropical latitudes we sometimes observe water of a beautiful blue color, as for instance in the Mediterranean and in other nearly land-locked basins, where the influx of fresher water being more or less impeded, the percentage of salt contained is raised by evaporation above the average.

Another important fact in connection with the Gulf Stream is its almost tropical temperature, due to the fact that its high velocity enables it to reach the middle latitudes with very little loss of heat. Upon entering its limits, the temperature of the sea water frequently shows a rise of 10° and even 15°. It was this fact that gave to the stream in the later years of the eighteenth century and the earlier years of the nineteenth an importance in the minds of navigators that it no longer possesses. In those days the chronometer, invented by Harrison in 1765, was still an experiment. Instruments were crude and nautical tables often at fault. The result was that the determination of the longitude was largely a matter of guesswork; a vessel after a voyage from the channel to America was often out of her reckoning by degrees instead of by minutes. The idea, first suggested by Benjamin Franklin, that the master of a vessel, by observing the temperature of the surface water, could tell the moment of his entry into the Gulf Stream, and hence could fix his position to within a few miles, was hailed with delight. The method was published in 1799 by Jonathan Williams in a work lengthily entitled "Thermometrical Navigation, being a series of experiments and observations tending to prove that by ascertaining the relative heat of the sea water from time to time, the passage of a ship through the Gulf Stream, and from deep water into soundings, may be discovered in time to avoid danger." In this work he makes the patriotic comparison of the Gulf Stream to a streak of red, white, and blue painted upon the surface of the sea for the guidance of American navigators.

The discovery of the stream is also alleged to have exercised a curious effect upon the commerce of some of our southern cities. In early days, when the only known sailing route was by way of the trades, it was the custom for vessels making the voyage from Europe late in the year to winter and refit at

Charleston or Savannah before attempting to reach the more northern ports of Boston and New York. The prevalence of northwesterly gales along the coast during the winter season renders the passage a trying one even to the larger ships and with the better navigation of the present time. The southern cities thus became, to a certain degree, half-way houses on the voyage, greatly to the benefit of their trade. With the aid of a thermometer, however, a vessel once making the stream was enabled to remain within it and to be thus borne along by the current until the desired northing was made, after which she headed up for port. Thus the necessity for making Charleston or Savannah was obviated and the advantage which they had hitherto enjoyed as commercial centers was lost.

From Hatteras the course of the stream leaving the coast bears toward the east-northeast. It ceases to exist as a stream current—that is, as a current which runs independently of the winds—shortly after crossing the fortieth parallel; even previous to that, the current observations in the square bounded by 35°–40° N., 65°–70° W. (off the coast from Hatteras to Sandy Hook) show for September, the month of maximum frequency, but 32 per cent of the whole number of observations setting northeast—i. e., only 7 per cent more than 25 per cent, which would be the number if there were no directive influence whatever. In this latitude the Gulf Stream becomes part and parcel of the general easterly drift which characterizes the waters of the ocean north of 35° in a manner quite analogous to the westerly drift of the Tropics and due to the same cause, namely, the prevailing winds, which, however, show none of the persistency of the trades.

The winds of the North Atlantic Ocean—as also of the several other oceans, the South Atlantic, South Pacific, North Pacific, and the Indian—are governed mainly by the presence of an almost permanent area of high barometer covering the main body of the ocean, around which the winds constantly circulate; the circulation in the Northern Hemisphere is in the same direction as the hands of a clock; in the Southern Hemisphere in a contrary direction, or in either hemisphere "with the sun," as it is expressed by sailors. In the North Atlantic the center of this area lies somewhat to the southwest of the Azores. On the southern slope of this barometric area the winds have an easterly direction, the northeast trades; on the northern slope, a westerly. These westerly winds, however, exhibit none of the constancy of the trades, being frequently interrupted by the wind systems proper to the alternate areas of high and low barometer which move across continent and ocean from west to east, and which form the governing feature of our own weather, the wind backing to the southeast with falling pressure, but hauling to northwest with rising, just as in the case of the trades, only to a much less extent. There is, however, a sufficient easterly component remaining to impart to the waters of the sea below the surface a distinct easterly motion, while on the surface itself there is apparently an utter lack of definite direction other than the fact that the direction of the current ordinarily agrees with the direction of the wind. How true this is may be gathered from a comparison of the observed winds and the observed currents for a given area. Take, for instance, the 5° square included between the parallels 40° and 45° N., 30° and 35° W.—about the middle of the Atlantic Ocean: The total number of wind observations recorded for the square was 8,898; that of reliable current observations, 719. Dividing each of these up into quadrants and setting the currents under that wind quadrant to which they are due, we have the following percentages:

	NE.	SE.	SW.	NW.
Winds	16	20	36	28
Currents	20	18	31	31

THE CONSTRUCTION OF CURRENT CHARTS.

For our knowledge of the surface currents of the sea as tabulated in the current charts used by navigators, or the movements of the waters as they actually take place, we were for a long time wholly dependent upon ships' observations. When at sea the position of a vessel at noon of each day is determined by two independent methods. The first of these is known as the position by observation, and as its name implies, means the position of the vessel as found by actual astronomical observation. The second is known as the position by dead reckoning, and is the position as found by reckoning up the vessel's progress from noon of the previous day, the compass giving the direction, the log the speed. In a majority of cases these two positions fail to agree. The astronomical position is then assumed to be correct, and the difference between them is set down as the current during the intervening twenty-four hours.

Thus let A be the position by observation at noon of a given day; B' the position by dead reckoning at noon of the following day, i. e., the position derived from a consideration of the course and distance during the intervening twenty-four hours. Suppose, however, that astronomical observations show that the actual position of the vessel at noon of the second day is at B. In this case B' B will be set down in the log as the current experienced during the intervening twenty-four hours. In case no astronomical observations can be obtained, as happens in fog or cloudy weather, the position by dead reckoning has to be adopted as the best obtainable, with the result that if such weather continues for several days in succession, as sometimes happens at certain seasons of the year, the true position of the vessel may differ considerably from the assumed position. To lessen the chance of disaster these current charts have been constructed, giving the results of current observations in the past, and the master of a vessel, by reference to them, is able to profit by the experience of those who have sailed over the same waters in previous years, and to some extent correct his own dead reckoning.

The current charts of the various oceans published by the British Admiralty, the charts which are universally employed by navigators, are the result of many thousands of observations taken since 1830. A glance at these charts will make plain the difficulty which confronts the navigator when approaching a dangerous coast, such as that of Newfoundland or of France, and compelled to rely upon his dead reckoning.

For a knowledge of the motions of the water throughout longer periods of time we are forced to depend upon the drift of floating objects, derelicts, wreckage, floating bottles bearing messages, and the like. All these objects are charted on the drift charts of the United States Hydrographic Office month by month. Two special attempts recently made to study the currents of the sea by this method deserve attention. The first is an effort to obtain a knowledge of the currents in the Arctic Ocean. Stout oaken casks, each one numbered and bearing a message, have been distributed by the Philadelphia Geographical Society among the whalers bound for the Arctic Ocean by way of Bering Sea, who winter in the vicinity of the mouth of the Mackenzie River. These casks are to be placed upon the ice as far eastward as circumstances permit, and the expectation is that they will enter the Atlantic Ocean either by Davis Strait or Barents Sea,[1] be noticed by passing vessels, and picked up. A letter from Dr. Bryant, the president of the society, states that 35 out of the 50 casks have been already sent out, and that in his opinion they may be looked for on the other side of the circumpolar area about a year from the spring of 1902.

The second project is the proposed investigation of the current in the neighborhood of Ushant and Finisterre by means of floating bottles. This has been undertaken by Lloyds, the great firm, of ship underwriters and has probably been sug-

[1] That part of the Arctic Ocean between Spitzbergen, Nova Zembla, and Greenland.

gested by the number of vessels lately lost in that vicinity, owing to the fact that they were out in their reckoning. The bottles, which are of gutta percha, are to be sealed and thrown into the sea by passing vessels, each one containing a label showing the date and the position at which it was cast adrift. They are then supposed to drift ashore and to be recovered. The expense involved is considerable. On the bottle it is stated that a reward of five francs will be paid for the return to any of His Majesty's consuls—an instance of liberality of expenditure in the acquisition of knowledge which is almost unprecedented.

SUMMER MEETING OF THE AMERICAN FORESTRY ASSOCIATION.

By Prof. ALFRED J. HENRY, U. S. Weather Bureau.

The American Forestry Association held its summer meeting at Lansing, Mich., August 27–28, 1902, under the joint auspices of the Michigan Forestry Commission and the Michigan Agricultural College. The sessions were held in the State Capitol and the Botanical Laboratory of the Agricultural College, Hon. Charles W. Garfield, Vice President of the Association for Michigan, in the chair.

The papers read and discussed at the meeting were for the most part upon practical problems in forestry and forest management, particularly as applied to the conditions which obtain in Michigan. It is gratifying to note in this connection that the people of that State, and indeed those of other States as well, are fully alive to the great necessity of taking prompt action looking to the preservation of their rapidly disappearing forests.

The advanced position that Michigan has taken in industrial affairs during recent years and the development of new industries has drawn rather heavily upon her water resources. The question of the constancy of stream flow and the possibility of developing additional power is now receiving attention so that a very substantial as well as a sentimental interest attaches to the preservation of the forests on the headwaters of her principal rivers.

During the last thirty-five years vast tracts of Michigan pine lands have been cut over and the merchantable timber removed. In many districts the lumberman has been succeeded by the agriculturist, and prosperous farming communities have been established. In other districts, especially in the region northwest of Saginaw Bay, the attempt at farming has not been as successful as might be wished. Many tracts of land from which the lumber has been removed were abandoned, and in course of time reverted to the State.

From the lands thus acquired the State has set apart about 57,000 acres in Roscommon, Crawford, and Oscoda counties as a forest preserve. At the same time a commission was appointed to have charge, not only of the forest preserve, but also of all matters relating to forests and forest management wherein the State was an interested party. Naturally much of the discussion of the meeting turned upon the measures best adapted to the reclamation of the waste lands, pine barrens as they are locally known, in the forest preserve and elsewhere in the State. These lands are for the most part unfit for agricultural purposes. The soil is sandy, coarse in texture, so coarse in fact that its capillary power is exceedingly low. The rain that falls upon it soon passes far below the roots of the scanty flora that now subsists upon it and is lost so far as plant life is concerned. That such a condition is not of recent origin is clearly shown by the fact that the present flora of the region is composed largely of species which have developed structural forms adapted to much less humid regions. On the other hand it should be remembered that a great part of these abandoned lands was once covered by a growth of magnificent white and Norway pine. The important question is therefore "Can not these trees be grown again?"

The concensus of opinion as expressed at the meeting was in the affirmative, but on certain of the poorer lands it would be necessary to first plant trees of a relatively low order in the economy of nature, as for example, the jack pine, a tree that will grow on lands that have been fire-swept and abandoned by other forest trees, or left to waste by the farmer.

The forest, as was pointed out by Dr. Gifford, performs simultaneously two important functions, soil fixation and soil betterment. The improvement of the soil would be a comparatively slow process, yet with the gradual formation of humus and with the added protection of the trees the moisture conditions would also improve, especially as regards the conservation of the snowfall, much of which is now wasted. Thus the way would be paved for the return of the better species of trees.

Mr. Thomas H. Sherrard of the Bureau of Forestry, United States Department of Agriculture, gave a general description of the physical characteristics of the lands in the forest preserve. He classed the existing forest covering as (1) Swamp; (2) Jack pine plain; (3) Oak flat; (4) Oak ridge, and (5) hardwood lands, and showed the distribution of these types in a representative township. Mr. Sherrard also gave an estimate of the possible production of a second crop of timber on these lands based upon measurements of existing second growth.

The climatologist will be interested chiefly in the deliberations of the several sessions respecting the destruction of the forests, the blighting effect of forest fires, and the diminution of stream flow due to these causes. Fortunately for the State, the scars made upon her surface are not so deep or lasting as they might have been under different conditions as to climate and topography. The rainfall is generally abundant for all needs, though not heavy enough to cut and seam the surfaces from which the timber has been removed. Then, too, owing to the humid climate, the original forest has in many cases become covered with a second growth of native trees or underbrush, thus preserving the character of the original covering. So far as can be judged from the scanty data available, deforestation has not changed the climate to an appreciable degree.

THE PERMANENCY OF PLANETARY ATMOSPHERES, ACCORDING TO THE KINETIC THEORY OF GASES.

By S. R. COOK, Case School of Applied Science, Cleveland, Ohio, dated September 3, 1902.

1. HISTORICAL.

Since the development of the kinetic theory by Clausius, Meyer, and Maxwell, and especially since it has been shown by Maxwell and Boltzmann that the molecules of any gas may have velocities ranging from zero to infinity, it has been a problem of intense interest to many scientists to determine the probability that the molecules of highest velocity may escape from the outer limits of an atmosphere, and hence deduce the condition of atmospheric permanence.

The vast extent of the gaseous envelope of the sun, the absence of an atmosphere around the moon, the extent and permanency of the atmosphere of the earth and the probable existence of atmospheres on the planets are problems that arouse and hold the interest alike of astronomers and physicists.

According to the nebular hypothesis, these bodies at one time all belonged to the same nebulous mass. It may then very naturally be assumed that under similar [temperature] conditions they would each contain the same forms of matter in their atmospheres. Various hypotheses, both chemical and physical, have been presented to explain the absence of all free gases from the surface of the moon. The presence of certain markings on Mars, that appeared to be accounted for by atmospheric conditions, has caused much interesting speculation and scientific discussion as to the probable constitution of this planet's atmosphere. The existence at times of what

appear to be rapidly dissolving snow fields has been cited as evidence that the atmosphere of Mars contains water vapor.

The permanence of the earth's atmosphere according to the kinetic hypothesis was probably first discussed by J. J. Waterston in a paper on The Physics of Media, read before the Royal Society in 1846. This memoir remained in the archives of the society until discovered by Lord Rayleigh and published in the Philosophical Transactions in 1892. The publication of Waterston's paper may or may not have had a stimulating influence on the scientific thought and the minds of those who were studying problems relative to the atmosphere, but at least there seems to have been a marked awakening contemporaneous with or shortly after that event. Between the date of its submission to the Royal Society and that of its publication the kinetic theory had received notable additions from the pens of Maxwell and Boltzmann; the law of the distribution of velocities had been established, and the kinetic theory had been placed on a mathematical basis so that the limitations of Waterston's paper can now be readily seen and the problem can be discussed anew from the point of view of the more recently developed theories.

Dr. G. Johnston Stoney had, prior to the publication of Mr. Waterston's paper, been a close student of the kinetic theory of atmospheres. On December 19, 1870, he delivered a discourse before the Royal Dublin Society on the absence of an atmosphere from the moon. In this address he showed that since the potential of gravitation on the moon is such that a free molecule moving in any outward direction with a velocity of 238 meters per second will pass beyond the radius of influence of the satellite, therefore any atmosphere whose molecules are capable of occasionally reaching that velocity can not be retained by the moon. Later Dr. Stoney communicated a second paper to the Royal Dublin Society showing that if the moon once had an atmosphere composed of gases similar to those in the earth's atmosphere and had lost it by molecular diffusion, then it follows that the earth itself could not retain free hydrogen in its atmosphere, and that probably water vapor could not be retained by Mars.

The year following the publication of Mr. Waterston's paper Dr. G. H. Bryan read a paper before the British Association on the Kinetic Theory of Atmospheres, an abstract of which was published in its Nottingham Report for 1893.[1]

In 1897 Dr. Stoney collected his several papers on the subject and published his memoir on "Atmospheres upon planets and satellites" in the Transactions of the Royal Dublin Society and in the Astrophysical Journal, 1898, Vol. VII, pp. 25–55. In this memoir Dr. Stoney based his calculations on the then supposed fact that helium, although continually escaping from springs and other natural sources into the atmosphere, did not accumulate as an important constituent element of the atmosphere. If helium, having a molecular weight of two times that of hydrogen, can not be retained by the earth, but filters outward through the atmosphere and, owing to its very great velocity, overcomes the gravitational force and escapes into the void beyond, then a definite limiting ratio between the molecular weight or the mean square velocity of the molecule and the potential of gravitation can be established that expresses the conditions under which the molecules of any gas can not be retained by a planet.

The writer, when reporting Dr. Stoney's memoir before the Physics Colloquium in the University of Nebraska, was impressed with the very great importance of this ratio in relation to the kinetic theory of atmospheres, provided it could be raised to the rank of a mathematical deduction under the laws of the kinetic theory by the application of the Boltzmann-Maxwell law of distribution of molecular velocities. He accordingly attempted to verify Dr. Stoney's results by applying the well-

established laws of the kinetic theory to the problem, and his paper "On the escape of gases from planetary atmospheres according to the kinetic theory" appeared in the Astrophysical Journal for January, 1900. Contemporaneous with the publication of this paper Dr. G. H. Bryan read a paper on the "Kinetic theory of planetary atmospheres" before the Royal Society. This paper appeared in the Transactions of the Royal Society, London, 1901.

2. WATERSTON'S METHOD.

Waterston based his calculations of the permanancy of an atmosphere on the assumption that the atmosphere was composed of molecules whose velocities at any position in a vertical column of the atmosphere are all the same and are proportional to the speed a molecule would attain in falling from the limits of the atmosphere to that position. The height of an atmosphere is thus proportional to the velocity of the molecule at the surface of the planet. In making this assumption, Waterston was in advance of his time with respect to the kinetic theory. He was, indeed, one of the first to apply mathematics to its more simple conceptions.

Since Waterston takes the velocity, v, of the molecules proportional to the height of the atmosphere, he concludes that, if the molecules were all moving in vertical lines, the height of an atmosphere would be the distance the molecule would go in overcoming gravity, or

1.
$$H = \frac{v^2}{2g},$$

but by considering the effect of the molecules moving at all possible angles to the vertical, he obtains

2.
$$H = \frac{v^2}{g}$$

as the height of an atmosphere, on the assumption that gravity is constant throughout the whole of this height. When the variation of g and the specific gravity of the gas composing the atmosphere are considered, Waterston obtains

3.
$$H = \frac{Rv^2}{Rgs - v^2},$$

where R is the radius of the earth and s is the specific gravity of the gas, air being taken as unity.

If under these conditions an atmosphere is escaping, H becomes infinity and putting $H =$ infinity in equation 3 we find,

4.
$$\frac{v^2}{s} = Rg.$$

Since for any gas the square of the velocity is directly proportional to the absolute temperature, and assuming that all molecules of the same gas, at a distance r from the center of the planet, have equal velocities, Waterston finds the temperature of the earth at which an atmosphere of air would slowly evaporate into space to be 65,760° F. Again, the temperature at which the moon would loose its atmosphere, taking into consideration the attraction of the earth, would be 2,405° F. From these conclusions it can easily be deduced that the atmospheres of the planets would be permanent even at much higher temperatures than is usually assumed for nonluminous bodies.

Waterston's results as to the permanency of atmospheres are of historic interest only. If, however, he had known and made use of the laws of distribution of velocities developed later by Maxwell his results would have been of much scientific value.

3. RESEARCHES BY DR. G. JOHNSTON STONEY.

As already mentioned, Dr. Stoney based his calculations on the permanency of atmospheres on the supposition that helium was escaping from the earth's atmosphere. Helium is continu-

---

[1] B. A. A. S. Nottingham Report, p. 682, 1893.

ally being supplied to the atmosphere from springs and other natural sources, and since the inertness of this gas makes it highly improbable that it enters into combination with other constituent elements of the atmosphere, therefore it must either remain a constituent element, or be absorbed, or escape.

Dr. Stoney argued that since it did not become a constituent element in the atmosphere it must be escaping from its outer limits, "Indeed, so promptly escaping," to quote his own words, "that the amount in transitu is too small for the appliances of the chemist to detect it." On the other hand water vapor, with a molecular weight of nine times that of hydrogen, is not sensibly leaving the earth's atmosphere. Hence Dr. Stoney concludes that the boundary between those gases that can effectually escape and those that can not, lies somewhere between gases consisting of molecules with twice the atomic weight of hydrogen, and gases consisting of molecules whose mass is nine times that of hydrogen.

Having given the velocity of the mean square[2] of the molecules of air at 0° C., we are able to calculate the velocity of the mean square of the molecules of any other gas whose density (compared with air at 0° C.) is ρ, by the formula of Clausius, as follows:

5. $$W = 485 \sqrt{\frac{T}{273 \rho}} \text{ met./sec.,}$$

where T is the absolute temperature, and 485 is the velocity of the mean square for air at 0° C. Using hydrogen as our standard this equation transforms into

6. $$W = 111.4 \sqrt{\frac{T}{\rho'}} \text{ met./sec.,}$$

where ρ' is the density of the gas considering hydrogen as unity.

In order to determine the velocity that a small body will attain in falling from infinity to the surface of a planet or other attracting body B, we have to consider the dynamical equation for acceleration and potential. Assuming that each body is homogeneous and spherical the acceleration at the surface of B, whose mass is M and radius R, is

7. $$a = \frac{M}{R^2}$$

and the potential of gravity at the surface is

8. $$K = \frac{M}{R}.$$

But K expresses the kinetic energy stored up in unit mass by a body in falling upon the surface of B from infinity, hence,

9. $$K = \tfrac{1}{2} v^2$$

where v is the velocity that would be acquired in falling from infinity.

If a' is the total acceleration including the acceleration γ, due to the rotation of the earth at the equator, then

10. $$a' = g + \gamma,$$

and if u is the velocity of the earth's surface at the equator and R its radius, then

11. $$\gamma = \frac{u^2}{R}.$$

If K' is the potential at a distance h from the surface of B whose radius is R, then

12. $$K' = \frac{R^2}{R+h} a.$$

Substituting the values 6,378 km., 200 km. 978.1 cm./sec.[2] and 464 m./sec. for the values R, h, g, and u at the equator of the

[2] The velocity W, whose square is the mean of the squares of the velocity, v, of the individual molecules, n, of a gas, is, for brevity, called "the velocity of mean square," and is expressed algebraically by the

formula $W = \sqrt{\dfrac{\Sigma v^2}{n}}$ [ED.]

earth, equation 9 gives for the least velocity a small body must have in order that it may go to infinity from a position 200 km. from the surface of the earth,

$$v' = 1101500 \text{ cm./sec.} = 11.015 \text{ km./sec.}$$

Deducting the equatorial velocity of the surface of the earth, (0.478 km./sec.), there results $v' - u = 10.537$ km./sec., or allowing for prevailing westerly winds one may take 10.5 km./sec. = 10,500 met./sec. as the least possible velocity that a molecule, favorably situated, must have in order that it may pass beyond the earth's attraction. This velocity $(v' - u)$ may be conveniently designated as the critical velocity.

The temperature at a position 200 km. from the surface of the earth was taken as $-66°$ C., or 207° absolute.[3] The velocity of the mean square for hydrogen at this temperature, by equation 6, is 1,603 met./sec., for helium 1,133 met./sec., and for water vapor 534 met./sec. The ratios of the above critical velocity to these velocities of the mean square or v'/w are for hydrogen 6.55, for helium 9.27, and for water vapor 19.66.

Now, since helium and hydrogen are both assumed to escape from the atmosphere of the earth while water vapor does not escape appreciably, Dr. Stoney concludes that any gas having a ratio less than 9.27 will escape, but gases whose ratio is equal to or greater than 19.66 will be imprisoned by the earth in its atmosphere. The following table is a summary of the computations and results arrived at by Dr. Stoney for all the planets and for an assumed temperature of $-66°$ C. or 207° absolute:

TABLE 1.

Name of planet or satellite.	Critical velocity in meters, v'.	Velocity of the mean square in meters, w.	Density of a gas that will escape as freely as does helium from the earth, ρ'.	Density of gas that will escape as freely as hydrogen ρ''.	Lightest of the known gases or vapors that will not escape.	Molecular weight.
Moon	2380	257.	19.5	39.	Carbondioxide	44
Mercury	4641*	500.6	10.25		Nitrogen	28
Venus	9546	1029.	2.56†		Water vapor	18
Earth	10500	1133.	2.		Water vapor	18
Mars	4805	517.	9.57		Nitrogen	28
Jupiter	47233	5095.	0.099		Hydrogen	2
Saturn	24508	2633.		0.37	Hydrogen	2
Uranus	17299	1865.		0.74	Hydrogen	2
Neptune	18002	1942.		0.68	Hydrogen	2

* Assuming its rotation period to be 88 days. † Calculated by the writer.

From the foregoing results deduced on the supposition that helium escapes from the earth, it follows that the moon can not retain an atmosphere whose molecules are less than 19.5 times the mass of the molecules of helium, or 39 times that of hydrogen. Mercury can not imprison an atmosphere whose molecules were less than 10.25 times the mass of the molecules of helium. Venus can retain an atmosphere similar to that of the earth, while Mars can not imprison water vapor at a temperature greater than $-78.3°$ C. The planets Jupiter, Saturn, Uranus, and Neptune, can all retain an atmosphere whose molecules are less than the molecules of hydrogen.

4. PERMANENCY OF ATMOSPHERES ACCORDING TO THE KINETIC THEORY.[4]

These results attained by Dr. Stoney are so important and so essential to the explanation of the permanency of atmospheres on the earth and planets that it seemed to me that the important factors in the determination of atmospheric permanency should, if possible, be placed on a rigorous mathematical basis. Being convinced that the well-known laws of the kinetic theory, and especially the Boltzmann-Maxwell law of distribution of velocities, around the velocity of the mean square from zero to infinity, would apply to the problem. I

[3] This temperature has been exceeded at the surface of the earth, and hence is not probable at 200 km. from the surface.
[4] Astrophysical Journal, January, 1900.

have attempted to verify Dr. Stoney's results by the application of the Boltzmann-Maxwell law, assuming such conditions as to boundaries and temperature as would make the number of escaping molecules a maximum. Since it is not possible in the present state of our knowledge to determine the temperature, density, or velocity of the molecules at the limit of the earth's atmosphere, or even to fix a definite boundary to its atmosphere, it becomes necessary to resort to some special hypothesis as to boundary and temperature. Even if the factors above referred to were known for a complex atmosphere composed of a number of different gases, yet the density of the hydrogen or helium atmosphere, even at the surface of the earth and at 0° C. are not accurately determined quantities. The method resorted to therefore was to assume a hydrogen or helium atmosphere containing the same number of molecules as is contained in the actual complex atmosphere, and to assume for each of these atmospheres arbitrary boundaries, the temperatures of which could be closely approximated.

This method has the advantage of eliminating the question as to the applicability of the kinetic theory to the limits of the atmosphere, where the paths of the molecules do not conform to straight lines; it also had the advantage of treating the atmosphere as a simple gas. In order that there may be no doubt as to the application of the method, and in order that my results may be compared with those obtained by Dr. Stoney four conditions were assumed as to the hydrogen or helium atmospheres, viz, (1) that the atmosphere is a spherical layer at the surface of the earth, at a mean temperature of 5° C., and whose thickness is the mean free path of a molecule having the critical velocity; (2) that the atmosphere is 200 km. in height, whose outer layer is at —66° C., according to Dr. Stoney[5]; (3), that the atmosphere is 20 km. in height and the temperature of its outer limits —66° C., in accordance with the recent balloon ascensions at Paris and Berlin; (4) that the atmosphere is 50 km. in height, and its outer layer at —180° C. according to Ferrel. These atmospheres of hydrogen or helium were assumed to have at the respective limiting heights well-defined boundaries, beyond which if a molecule passed it could not be returned to the atmosphere by impact.

The number of molecules per unit volume at the boundary of these atmospheres was assumed to be the same as would be contained in unit volumes of the earth's atmosphere at the respective heights. Molecules of hydrogen or helium in their respective atmospheres will not be in a position to escape, no matter what their velocity, unless they are at some time within a distance equal to their free paths from the limits of the atmosphere. It is, therefore, only necessary to consider the molecules contained in a spherical shell at the boundaries of their respective atmospheres, and whose thickness is λ', where λ' is the mean free path of the molecules having the critical velocity.

The number of molecules in this spherical layer was computed from the well known experimental formula for pressure,

13. $$P_h = p_o e^{-\frac{h}{u}}.$$

The number of molecules per unit volume at normal pressure is taken as 10^{19} according to Maxwell's determination.

Having any given number of molecules, N_o, whose velocity of the mean square is c_o, it is a very simple matter to calculate the number of molecules, dN_o, that will have any given velocity, c_i; this number dN_o is, according to Maxwell, given by the differential equation:

14. $$dN_o = \frac{4N_o}{C_o \sqrt{\pi}} \times \frac{C^2}{C_o^2} \times e^{-C^2/C_o^2} \, dc$$

Integrating this equation between the limits $C = c'$ and $C = \infty$

[5] The temperature at 20 km. is probably nearer —74° C.

where c' is the critical velocity, we find the number of molecules n' that will have a velocity rc_o when $r =$ or > 1 as given by the equation,

15. $$n' = 2 \, n_o \, e^{-x^2} \left(x + \frac{1}{2r} - \frac{1}{4r^3} + \frac{3}{8r^5} - \frac{15}{16r^7} + \ldots \right)$$

where x is written for $\frac{2r}{\sqrt{\pi}}$. When r is a quantity much greater than unity this series becomes rapidly converging, and n' for any velocity rc_o can be readily evaluated. In the calculations that follow r varies from 5.92 for hydrogen at 5° C. to 14.5 for helium at —180° C., and only the first three or four terms of the series need be employed.

Having then determined the number of molecules, N_o, in any of the foregoing spherical shells whose thickness is λ, and by the above formula having determined the number of molecules, n', that will have a velocity equal to or greater than the critical velocity, it is only necessary to determine the probability that these n' molecules will be so favorably situated as to be emitted by the spherical shell into the void beyond.

If n is the number of molecules in the spherical shell at the boundary of the respective atmospheres and n' is the number of molecules among the n molecules that have a velocity equal to or greater than the critical velocity, then in order that the n' molecules be so favorably situated as to be emitted by the spherical shell through its outer surface, they must have positive component velocities normal to the surface of the spherical shell equal to the critical velocity (considering velocities away from the earth as positive). If n_1 be the number of molecules in unit volume in the spherical shell, R_1 its radius, and $r\lambda = \lambda'$ its thickness, then

16. $$n' = 4\pi R_1^2 r\lambda n_1,$$

where n' is the number of molecules in the spherical shell.

Since the critical velocity, c', is equally probable in all directions, in order to find the number of molecules that will pass through the outer surface of the spherical shell with a velocity c' or greater we determine c'_m the mean velocity of the molecules having a velocity between the critical velocity and infinity. Since any molecule will escape whose component velocity normal to the shell is

17. $$c_1 = c'_m \cos \theta,$$

the proportion of those that will escape during the time t_1 is $\varphi / 4\pi$; where t_1 is the time of the mean free path $r\lambda$ of those molecules, and φ is the solid angle of aperture 2θ. Hence, to the first order of approximation the number of molecules that will escape in time t_1 will be:

18. $$n_2 = 2\pi R_1^2 \, r\lambda K n' (1 - \cos \theta),$$

where K is written for $2e^{-x^2} \left(x + \frac{1}{2r} - \frac{1}{4r^3} + \ldots \right)$ the term that occurs in equation 15. The number that will escape in any other time, T, will be

19. $$n_3 = 2\pi R^2 r\lambda K n' (1 - \cos \theta) \frac{T}{t_1}.$$

This formula gives a maximum limit to the number of molecules that will be emitted from the spherical shell with a positive component velocity normal to the surface equal to or greater than the critical velocity.

The quantities on the right hand side of equation 19 can all be determined from the kinetic theory, except the critical velocity c', which, by combining equations 9 and 12, is given by the following:

20. $$c'^2 = 2a \frac{R}{R_1},$$

a being the total acceleration, R the radius of the earth, and R_1 the radius of the spherical shell.

In the following tables the first three columns specify the

four conditions described at the beginning of this section. The fourth column gives the critical velocity C' in kilometers per second. The fifth column gives r, or the ratio of the critical velocity to the mean velocity. The sixth column gives N_2, or the number of molecules that will escape during the time t_1. The seventh column gives the number of molecules that will escape in one year. And the eighth column gives the number of molecules that would have escaped during the period of the earth's existence, supposing that to be 10^7 years, in accordance with Lord Kelvin's latest figures.

TABLE 2.—*Hydrogen.*

Conditions.	Temperature.	Height in km.	Critical velocity, c'.	Critical velocity divided by mean velocity, r.	N_2 (molecules in c. c.) $T=t_1$ sec.	N_3 in c. c. $T=1$ year.	N_3 in c. c. $T=10^7$ years.
No.	°C.						
1	5	λ′	11.	5.92	$80.24 \times 10_4^{19}$	33.04×10^{-7}	33.04×10^{15}
2	— 66	200	10.5	6.55	$45.15 \times 10_9$	23.58×10^{-2}	23.58
3	— 66	20	10.98	6.85	$72.61 \times 10_{-6}$	54.28×10^{-10}	54.28×10^6
4	—180	50	10.90	10.14	66.8×10^{-6}	43.5×10^{-6}	43.5×10^{-8}

TABLE 3.—*Helium.*

	°C.						
1	5	λ′	11.	8.37	19.8	10.34×10^{-11}	10.34×10^{-4}
2	— 66	200	10.5	9.27	$44.5 \times 10^{-18}_{-19}$	22.10×10^{-31}	22.10×10^{-24}
3	— 60	20	10.98	9.78	$50.15 \times 10_{-83}$	26.73×10^{-93}	26.73×10^{-86}
4	—180	50	10.90	14.5	$19.27 \times 10^{-}$	$91.6 \times 10^{-}$	$91.6 \times 10^{-}$

The values of N_3 were computed from equation 19 and show the number of molecules or cubic centimeters of hydrogen that would escape from a hydrogen or helium atmosphere under the specified conditions.

Condition No. 4 represents most nearly the condition of the outer limits of the earth's atmosphere: 43.5×10^{-8} or less than one billioneth of a cubic centimeter of hydrogen would escape from a hydrogen atmosphere thus bounded and conditioned in 10,000,000 years, and 91.6×10^{-86} c. c. of helium would escape from a helium atmosphere similarly conditioned, during the same period. Since only a very small part of a cubic centimeter of hydrogen will escape from a hydrogen atmosphere during the possible age of the earth, it is evident that the amount which is actually escaping from the very attenuated hydrogen atmosphere that no doubt exists in the upper strata of the earth's atmosphere is insignificant. The amount of helium escaping would be zero.

There are approximately 10^{24} c. c. of air in the earth's atmosphere and under the most favorable conditions less than 10^{10} c. c. of hydrogen would escape from an atmosphere of hydrogen whose outer layer was 5° C. and whose density was the density of hydrogen at atmospheric pressure, during one year. It would under these conditions take 10^{14} years for an amount of hydrogen equal to the earth's atmosphere to escape. Under the most favorable conditions it would take 10^{11} years for one c. c. of helium to leave the earth, while under the conditions assumed by Dr. Stoney it would take 10^{31} years for 22 c. c. of helium to escape.

Let us now apply the results attained for an atmosphere of hydrogen on the earth to the atmospheres of the moon and planets. The relation between the velocities of the molecules and the absolute temperature is,

21.
$$\frac{C^2}{C_0^2} = \frac{T}{T_0}$$

The following table gives the temperature centigrade of the outer layer of a planet or moon that would enable its atmosphere to escape at the same rate that hydrogen would escape from an atmosphere of hydrogen whose outer layer is conditioned as in (1) and whose critical velocity is five times the velocity of the mean square at 0° C., the number of molecules in the hydrogen atmosphere being the same as in the earth's atmosphere and the time allowed for the atmosphere to escape being 10^9 years, or 100 times Lord Kelvin's age of the earth.

TABLE 4.

	C'	C_v	Hydrogen.		Air.		Carbondioxide.	
			$t.$	r_1	$t.$	r_1	$t.$	r_1
	km./sec.	km./sec.	°C.		°C.		°C.	
Moon	2.380	.476	—256	1.24	—10	4.7	274	6.6
Mercury	4.468	.8936	—209	2.4	894	9.2	1371	12.4
Venus	9.540	1.909	29.5	5.185	5031	19.27	7403	26.5
Mars	4.803	.960	—195	2.66	1139	9.9	1807	13.3
Earth	10.5	2.100	291	5.7	9937	21.7	14447	29.17

C' is the critical velocity in kilometers per second; C_v is the velocity of the mean square $= C'/5$; t is the temperature of the outer layer of the atmosphere in centigrade degrees, and r_1 is the ratio of the critical velocity to the velocity of the mean square at 0° C.

It is evident, from Table 4, that an atmosphere of hydrogen would escape from the moon at a temperature of —256° C., an atmosphere of air at —10°, and an atmosphere of carbondioxide at 274° C. On all the superior planets and at 0° C. an atmosphere of air and carbondioxide would be permanent.

5. THE KINETIC THEORY OF PLANETARY ATMOSPHERES BY DR. BRYAN.

Dr. Bryan in his paper of 1901, above referred to, on the Kinetic Theory of Planetary Atmospheres extends the Boltzmann–Maxwell law of the distribution of the velocity of molecules to the condition of a planetary atmosphere in which the molecules are under an external force and have in addition to their velocity of the mean square a velocity due to the rotation of the planet.

Assuming the Boltzmann–Maxwell law of velocity distribution for a quiescent gas Dr. Bryan finds that the law for the molecular distribution in an atmosphere of a rotating planet may be expressed in the following form

22.
$$n - hm\left\{-(\xi'^2 + \eta'^2 + \zeta'^2) - V - \tfrac{1}{4}\Omega^2(\xi^2 + \eta^2)\right\} d\xi\, d\eta\, d\xi'\, d\eta'\, d\zeta'$$

where n is proportional to the total number of molecules; ξ', η', ζ' are the component velocities in the direction ξ, η, ζ; V is the gravitation potential and Ω the angular velocity.

In this expression the distribution of coordinates and relative velocities is the same as if the axis were fixed and the potential of the field of force were increased by the term $-\tfrac{1}{2}\Omega(\xi^2 + \eta^2)$. This term represents the potential of centrifugal force due to rotation with angular velocity Ω.

Using this form for the function representing the frequency of distribution Dr. Bryan finds that the rate at which the molecules of any planetary atmosphere are escaping across a concentric spherical surface is given by the formula

23.
$$\frac{4\pi n}{h^3 m^3 \Omega}\left\{ e^{hm\Omega rQ}\left[1 + \frac{\Omega r}{4(Q - \Omega r)}\left\{1 - \frac{1}{hm(Q - \Omega r)^2} + \right.\right.\right.$$
$$\left.\left. + \frac{1}{h^2 m^2(Q - \Omega r)^2}\right\}\right] + e^{-hm\Omega rQ}\left[1 - \frac{\Omega r}{4(Q + \Omega r)} \times \right.$$
$$\left.\left. \left\{1 - \frac{1}{hm(Q - \Omega r)^2} + \frac{1}{h^2 m^2(Q - \Omega r)^2}\right\}\right]\right\}$$

Where $Q^2 = 2\dfrac{m}{r}$. This formula might be applied to determine the rate at which a planet is losing its atmosphere. The above law of distribution, however, does not hold beyond a certain distance from the planet. In order to find the critical surface beyond which the formula (23) does not apply, Dr. Bryan de-

termines the condition for the limit of the height of an atmosphere by the following method.

According to the kinetic theory the termination of an atmosphere is determined by the fact that the density of the atmosphere is proportional to

24. $e^{-hm\left\{v-\frac{1}{2}\Omega^2 r^2\right\}}$

where $r^2 = \xi^2 + \eta^2$.

"Where $dv/dr > \Omega^2 r$ the density decreases as we proceed outwards from the axis of the planet. It becomes minimum when

25. $dv/dr = \Omega^2 r$

and begins to increase again outward when $dv/dr < \Omega^2 r$, hence the point at which the centrifugal force is just balanced by the planet's attraction is the point of minimum density in the atmosphere according to the above law of permanent distribution. And since the atmosphere does not extend to infinity, we conclude that it can not be permanent unless the density at the point of minimum density is infinitesimal and practically zero."

Dr. Bryan then proceeds to calculate the ratio of the density of a gas at the surface of the planet to its density at the critical surface. This ratio is called the critical density ratio. The critical velocity ratio can be very readily calculated, since according to formula (25) the minimum density at the critical surface is proportional to

26. $e^{-hm(v-\frac{1}{2}\Omega^2 r^2)}$

The condition for permanency of an atmosphere requires that this ratio be very large, hence in general it will be sufficient to know this ratio correctly to the nearest power of 10 and this is shown by tabulating the logarithms of this ratio to the base 10.

If V_0 is the gravitational potential at the planet's surface; u the velocity of the planet's equator due to axial rotation; V_1 the combined potential of gravitation and centrifugal force at the critical surface, then the logarithm of the critical density ratio is equal to

27. $\mu h m \left(V_0 + u^2/2 - V_1\right)$

where μ is the modulus of the common logarithms. The data used was the same as given in Dr. Stoney's memoir[6].

Table 5 gives the calculated density ratio for hydrogen relative to the earth.

TABLE 5.

Absolute temperature.	Centigrade temperature.	Logarithm of critical density ratio.
100°	—173°	50. 951
200°	— 73°	25. 475
300°	27°	16. 987

The meaning of this table will be made more apparent by a concrete example. Suppose with Dr. Stoney we take 10^{21} as the number of molecules in each cubic centimeter of gas at normal pressure, and normal temperature, then at the critical surface and at $+27°$ C. there will be $10^{21-16.987}$ or approximately 10^4 or 10,000 molecules per cubic centimeter. At the critical surface and at $-73°$ C. there will be $10^{21-25.475}$, or $10^{-4.475}$, or one molecule for every 30,000 cubic centimeters at the critical surface. At $-173°$ C. only one molecule will occur in 10^{30} cubic centimeters at the critical surface. It is evident that in the last two cases a hydrogen atmosphere will be quite permanent, while in the first case a considerable quantity of the hydrogen will be in a position to escape.

The calculation of this critical density ratio may easily be extended to the planets. Table 6 gives the logarithms of the ratios for hydrogen for several planets.

[6] See Table No. 1.

TABLE 6.

Planets.	100° absolute.	200° absolute.	300° absolute.
Venus	40. 6360	20. 3180	13. 5453
Earth	50. 9510	25. 4750	16. 987
Mars	10. 4690	5. 2345	3. 4896
Jupiter	711. 9400	355. 9700	237. 3100
Saturn	165. 9800	82. 9900	55. 3300

From the magnitude of these logarithms of the critical density ratio the permanency of a hydrogen atmosphere on any of the planets, with the exception of Mars, is quite evident at temperatures below 200° absolute, and for Jupiter and Saturn at even higher temperatures.

Since the logarithm of the critical density ratio is directly proportional to the density and inversely proportional to the absolute temperature, its value may be easily determined for any other gas or any other temperature; thus the logarithms of the critical density ratio for helium on the earth and for water vapor on Mars are given by multiplying the values for hydrogen by 2 and 9, respectively.

TABLE 7.

	100° absolute.	200° absolute.	300° absolute.
Helium on the earth	101. 90	50. 95	33. 97
Water vapor on Mars	94. 22	47. 11	31. 41

The logarithms of the critical density ratio give a very good idea in regard to the permanency of an atmosphere on a planet, but they do not give the amount of the atmosphere that will escape from the planet in any given time. Dr. Bryan has, however, also calculated the time required for the escape of an amount represented by a layer covering the planet 1 centimeter thick. He used the formula,

28. $E = \dfrac{25t}{144} \cdot \dfrac{R^2 q}{a^2}$,

where E is the time in years, t the number of seconds in E years, and q the mean velocity.

For hydrogen at 100° absolute temperature and for E equal to one year, the following table obtains for logarithm E:

TABLE 8.

Hydrogen at —173° C. = 100° absolute.	Log. E.
Earth	14. 40133
Venus	14. 35456
Mars	14. 35149
Jupiter	13. 47129
Saturn	13. 27377

From this Dr. Bryan deduces that "If the logarithm of the critical density ratio for a given gas at a given temperature relative to a given planet is about 14, the total rate of effusion of that gas across the critical surface would be equivalent to the removal of the amount of that gas present in a layer 1 centimeter thick over the surface of the planet in a period of time comparable with a year."

The number of years in which a superficial layer of gas 1 centimeter thick will escape from a planet may also be calculated. The following table obtains for atmospheres of hydrogen and helium on the earth:

TABLE 9.

Hydrogen at absolute temperature.	Helium at absolute temperature.	Years.
100	200	3. 54 × 10^{36}
150	300	3. 06 × 10^{19}
200	400	8. 40 × 10^{10}
250	500	6. 02 × 10^{5} = 602,000
300	600	2. 22 × 10^{2} = 222

For water vapor in Mars Table 10 obtains:

TABLE 10.

Vapor of water at absolute temperature.	Years.
200	1.22×10^{33}
250	3.37×10^{22}
300	1.94×10^{16}
400	$2.40 \times 10^{9} = 2,400,000,000$
500	$4.28 \times 10^{4} = 42,800$
600	$1.66 \times 10^{2} = 166$

Dr. Bryan arrives at the following conclusions:

1. The earth's attraction is capable, according to the kinetic theory, of retaining a gas of twice the weight of hydrogen in the form of a (practically) permanent atmosphere of uniform temperature as high as any temperature commonly existing in its present atmosphere.

2. The vapor of water is similarly capable, according to the kinetic theory, of existing on Mars in the form of a (practically) permanent atmosphere of uniform temperature at any ordinary temperature.

It appears from the foregoing that according to the kinetic theory the assumption that helium, because of its frequently recurring high molecular velocities, is escaping from the earth's atmosphere is not warranted, and, therefore, the conclusion that the vapor of water can not be retained by Mars is not warranted, at least under the conditions usually assumed for their atmospheres.

This paper would, however, not be complete without a reference to Dr. Stoney's reply[7] to the papers "On the Escape of Gases from Planetary Atmospheres According to the Kinetic Theory," by the writer, and "The Kinetic Theory of Planetary Atmospheres," by Dr. Bryan.

In his reply Dr. Stoney argues that the Boltzmann-Maxwell distribution will not account for the number of molecules attaining a velocity many times greater than the velocity of the mean square. Dr. Stoney concludes[8] that out of N free paths the actual number whose speed lies between v and $v + dv$ is

29　　　　　　$$N(\pi + \delta)\, dv$$

where π is the probability function, which according to the Boltzmann-Maxwell law, is a function of v only, while δ is a function of the variables, v, h, n', θ, t, etc.

Where v is the speed; n, the number of molecules; n', the number of encounters; θ, the average duration of the free path; t, the average duration of an encounter; and where etc. stands for any other variable that might influence the value of δ.

Allowing the validity of this equation it seems from the nature of the functions δ and π that δ can not be many times greater than π. But even if δ could by some means attain to the value of $100\,\pi$ or $10,000\,\pi$ the permanency of an atmosphere of helium on the earth would not be materially affected, as will be evident by referring to Tables 2, 7, and 9. The fact that δ is a function of variables that may be either positive or negative would indicate that its value can not be large compared with the value of π, if indeed its value is not zero.

The value of Dr. Stoney's researches on the permanency of atmospheres must be determined more from the fact that they have opened up new fields of inquiry, and paved the way for the development of the kinetic theory of atmospheres, than from the specific result reached by the a priori method.

More recently M. E. Rogowsky[9] has discussed planetary atmospheres, but since he based his calculations on the results furnished by Dr. Stoney's memoir his conclusions, some of which are indeed very remarkable, must be modified in accordance with his note in Nature for July 3, 1902, i. e., in accordance with the results arrived at by the kinetic theory. In summing up these researches on the escape of gases from plane-

[7] Astrophysical Journal, 11, pp. 251, 357, 1900.
[8] loc. cit. 22, pp. 363.
[9] Astrophysical Journal, November, 1901.

tary atmospheres and the kinetic theory of planetary atmospheres we conclude:

1. That helium forms a constituent though very small part of the earth's atmosphere,[10] and that according to the kinetic theory the earth will retain an atmosphere of helium at temperatures much higher than those that are known to prevail.

2. That the vapor of water will remain on the planet Mars at ordinary temperatures.

3. That according to the kinetic theory the moon, if it had a mean temperature of $0°$ C. would lose an atmosphere of nitrogen and oxygen.

4. That all the planets can retain atmospheres similar to the earth's atmosphere, and that the superior planets can retain atmospheres composed of gases much lighter than hydrogen.

CLIMATOLOGY OF COSTA RICA.

Communicated by H. PITTIER, Director, Physical Geographic Institute.

[For tables see the last page of this REVIEW preceding the charts.]

Notes on the weather.—On the Pacific slope the rain has been very scarce, the total amount for the month remaining in most cases inferior to the third part of the normal fall. As an immediate consequence, the coffee crop has been greatly diminished by premature ripening and by the havoc of several insect pests, the development of which has been favored by the prevailing drought. In San Jose the pressure has been about normal, the temperature slightly above the mean; rainfall 163 mm. against 241, normal; sky generally cloudy. On the Atlantic slope the rain has continued in excess of previous years, with the usual accompanying landslides and inundations.

Notes on earthquakes.—August 6, $0^h\ 10^m$ p. m., slight shock, E–W, intensity I, duration 2 seconds. August 11, $7^h\ 20^m$ p. m., slight shock, NE–SW, intensity II, duration 3 seconds. August 12, 8^h a. m., strong shock, E–W, intensity III, duration 6 seconds. August 13, $5^h\ 55^m$ a. m., tremors with several interruptions, total duration 8 seconds. August 16, $2^h\ 17^m$ a. m., several consecutive shocks, E–W, intensity III, duration 20 seconds. August 18, $11^h\ 31^m$ p. m., sensible shock, E–W, intensity III, duration 12 seconds.

HAWAIIAN CLIMATOLOGICAL DATA.

By CURTIS J. LYONS, Territorial Meteorologist.

GENERAL SUMMARY FOR AUGUST, 1902.

Honolulu.—Temperature mean for the month, $78.5°$; normal, $77.7°$; average daily maximum, $83.7°$; average daily minimum, $74.2°$; mean daily range, $9.5°$; greatest daily range, $13°$; least daily range, $5°$; highest temperature, $86°$; lowest, $72°$.

Barometer average, 29.971; normal, 29.980; highest, 30.09, 29th; lowest, 29.86, 4th; greatest 24-hour change, that is, from any given hour on one day to the same hour on the next, .07; lows passed 4th and 24th; highs, 15th and 29th.

Relative humidity average, 70.5 per cent; normal, 68.5 per cent; mean dew-point, $67.3°$; normal, $66°$; mean absolute moisture, 7.32 grains per cubic foot; normal, 7.01 grains; dew on grass, 0.

Rainfall, 1.74 inches; normal, 1.97 inches; rain record days, 25; normal, 18; greatest rainfall in one day, 0.26 on the 14th; total at Luakaha, 9.08 inches; normal, 11.02 inches; total at Kapiolani Park, 0.42 inch; normal, 0.71 inch.

The artesian well level fell during the month from 33.40 to 33.10 feet above mean sea level. August 31, 1901, it stood at 33.30. The average daily mean sea level for the month was 9.78 feet, the assumed annual mean being 10.00 above datum. For August, 1901, it was 10.38. Trade wind days, 30 (3 of

[10] Chemical News, 1895. Heinrich and Kayser. Nature, September 28, 1898. E. C. C. Baly. Nature, September 28, 1898. Ramsay & Travers. Nature, October 13, 1898. William Crookes. Nature, July 4, 1901. Prof. James Dewar.

north-northeast); normal number for August, 29. Average force of wind (during daylight), Beaufort scale, 3.6. Average cloudiness, in tenths of sky, 4.2; normal, in tenths of sky, 4.0.

Approximate percentages of district rainfall as compared with normal: South Hilo, 160 per cent; North Hilo, 220 per cent; Hamakua, 210 per cent; Kohala, 125 per cent; Waimea (Hawaii), 200 per cent; Kona, 68 per cent; Kau, 40 per cent; Puna, 200 per cent; Maui, 160 per cent; excepting Wailuku, 40 per cent; Oahu, 85 per cent; excepting Kahuku, 200 per cent; Kauai, 145 per cent. The rain on Oahu has been frequent but not of much volume.

Rainfall data for August, 1902.

Stations.	Elevation.	Amount.	Stations.	Elevation.	Amount.
HAWAII.			**OAHU.**		
HILO, e. and ne.	*Feet.*	*Inches.*	Punahou (W. B.), sw.	47	*Inches.* 1.74
Waiakea	50	18.39	Kulaokahua, sw	50	1.04
Hilo (town)	100	20.85	U. S. Naval Station, sw	6	1.12
Kaumana	1,250	34.78	Kapiolani Park, sw	10	0.42
Pepeekeo	100	15.74	Manoa (Woodlawn Dairy), e.	285	6.64
Hakalau	200	18.40	School street (Bishop), sw	50	2.04
Honohina	300	22.41	Insane Asylum, sw	30	1.76
Laupahoehoe	500	27.86	Kalihi-Uka, sw	260	7.37
Ookala	400	20.11	Nuuanu (W. W. Hall), sw	50	1.63
HAMAKUA, ne.			Nuuanu (Elec. Station), sw.	405	4.60
Kukaiau	250	14.66	Nuuanu (Luakaha), e	850	9.08
Paauilo	750	11.82	Waimanalo, ne	25	1.10
Paauhau (Mill)	300	8.25	Maunawili, ne	300	3.01
Honokaa (Muir)	425	9.59	Ahuimanu, ne	350	4.72
Kukuihaele	700	11.15	Kahuku, n	25	3.54
KOHALA, n.			Waialua, n	20	0.10
Niulii	200	7.72	Wahiawa, e	900	1.50
Kohala (Mission)	521	6.80	Ewa Plantation, s	60	0.00
Kohala (Sugar Co.)	235	7.10	Moanalua, sw	15	0.81
Hawi Mill	600	6.52	U. S. Magnetic Station	50	0.00
Waimea	2,720	6.16	Rhodes gardens (Manoa)	300	9.68
KONA, w.			Experiment Sta., U. S	350	2.40
Holualoa	1,350	5.18	Nahuina (Castle)	1,150	7.87
Kealakekua	1,580	5.17	**KAUAI.**		
Napoopoo	25	2.53	Lihue (Grove Farm), e	200	3.29
KAU, se.			Lihue (Molokoa), e	300	4.31
Kahuku Ranch	1,680	3.45	Lihue (Kukaua), e	1,000	6.96
Honuapo	15	0.98	Kealia, e	15	0.77
Naalehu	650	2.28	Kilauea, ne	325	6.23
Hilea	310	1.30	Hanalei, n	10	9.02
Pahala	850	2.14	Eleele, s	200	0.82
PUNA, e.			Wahiawa Mountain, s	2,100	14.45
Volcano House	4,000	14.34	McBryde (Residence)	850	4.39
Olaa, Mountain View	1,690	36.53	Lawai	450	5.81
Kapoho	110	10.58	East Lawai	800	5.02
MAUI.			West Lawai	200	2.94
Walopae Ranch, s	700	1.36			
Kaupo (Mokulau), s	285	9.08	**Delayed June reports.**		
Kipahulu, s	300	9.52	Honokaa (Meinicke)		1.15
Nahiku, ne	800	20.76	Kapoho		8.64
Haiku, n	700	5.89	Hilo (town)		8.49
Kula (Erehwon), n	4,500	4.46	Pahala		0.49
Kula (Waiakoa), n	2,700	2.58	Kahuku, Kau		3.09
Puuomalei, n	1,400	7.80	Hawi Mill		3.70
Haleakala Ranch, n	2,000	3.13	Kaumana		13.80
Wailuku, ne	200	0.40	Puuohua		12.38

NOTE.—The letters n, s, e, w, and c show the exposure of the station relative to the winds.

Mean temperatures: Pepeekeo, Hilo district, 100 feet elevation, mean maximum, 78.3°; mean minimum, 71.8°; Waimea, Hawaii, 2,730 elevation, 76.8° and 66.0°; Kohala, 521 elevation, 79.3° and 69.1°; Waiakoa, Kula, Maui, 2,700 elevation, 85.3° and 62.4°; Ewa Mill, 50 elevation, 86.1° and 72.0°; United States Magnetic Station, 50 elevation, 89.7° and 71.9°; United States Experiment Station, Jared W. Smith, 350 elevation, 85.2° and 72.1°; W. R. Castle, Honolulu, 50 elevation, highest, 87°; lowest, 71°; mean, 78.6°; Waikiki Beach, 10 elevation, 83.7° and 75.3°

NOTE.—The mean temperature of a station in Hawaii should be considered as the mean of maximum and minimum, minus 0.7°.

Ewa Mill mean dew point, 67.0°; mean relative humidity, 70.4 per cent; United States Magnetic Station, 65.5 and 65.0 per cent; Kohala, Dr. B. D. Bond, 69.3° dew-point, 84.0 per cent relative humidity.

Earthquakes reported: Pepeekeo, Hilo, 8th, 2.15 p. m., Hilo, 15th, 2.25 p. m.; Hilo, 25th; Papaaloa, 26th, 7 p. m.; 27th, 3 a. m. Lake of molten lava 400 feet in diameter appeared in the bottom of Halemaumau pit in Kilauea crater on the even-

ing of the 25th, said to be 800 or more feet below general floor of crater, but rising.

Afterglows noticed, but not as brilliant as in the previous months.

Electric storms near Honolulu 3d and 4th, 19th and 20th; on Hawaii 6th, 20th, 21st. This number is rare for this month.

Heavy surf noted, Hawaii, 3d, 14th, 21st, 30th; Honolulu, 25th. Strong winds, 12–15th, 28th–31st.

OBSERVATIONS AT HONOLULU.

The station is at 21° 18′ N., 157° 50′ W. It is the Weather Bureau station Punahou. (See fig. 2, No. 1, in the MONTHLY WEATHER REVIEW for July, 1902, page 365.

Hawaiian standard time is 10ʰ 30ᵐ slow of Greenwich time. Honolulu local mean time is 10ʰ 31ᵐ slow of Greenwich.

Pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.

The rainfall for twenty-four hours is measured at 9 a. m. local, or 7.31 p. m., Greenwich time, on the respective dates.

The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet, and the barometer 50 feet above sea level.

Meteorological Observations at Honolulu, August, 1902.

Date.	Pressure at sea level.	Temperature. Dry bulb.	Temperature. Wet bulb.	During twenty-four hours preceding 1 p. m. Greenwich time, or 1:30 a. m. Honolulu time. Temperature. Maximum.	Minimum.	Means. Dew-point.	Relative humidity.	Wind. Prevailing direction.	Force.	Average cloudiness.	Sea-level pressures. Maximum.	Minimum.	Total rainfall at 9 a. m., local time.
1	29.96	75	70	84	69	67.7	75	ne.	3	4	30.00	29.93	0.00
2	29.97	77	70.5	85	75	68.3	71	ne.	3	2	30.01	29.94	0.01
3	29.98	76	70.5	85	76	67.3	68	ne.	4	4	30.03	29.97	0.02
4	29.89	77	72	83	74	69.7	76	ne.	4	5-2	30.01	29.89	0.05
5	29.82	74	72.7	83	75	70.0	79	se-s.	1	10	29.95	29.86	0.37
6	29.96	74	72	84	72	71.0	81	ne.	1	10-4	30.02	29.93	0.03
7	29.99	77	70.5	86	73	70.0	76	ne.	3	4	30.03	29.95	0.00
8	29.98	75	69	85	75	67.7	68	ne.	3	3	30.02	29.95	0.01
9	29.93	74	68	84	74	66.0	67	ne.	3	1	29.98	29.90	0.02
10	29.93	74	69	82	74	64.7	67	ne.	3-1	6-2	29.98	29.91	0.01
11	29.96	76	70	83	72	66.7	74	nne.	3-4	5	30.00	29.93	0.04
12	30.00	78	72	85	73	67.3	68	3-4	2	30.05	29.95	0.03
13	29.99	76	71	85	75	69.0	72	ne.	4-5	7-3	30.04	29.96	0.06
14	29.96	77	71.5	79	74	71.5	83	ne.	4-5	8	30.02	29.94	0.26
15	29.99	76	67.5	83	76	68.0	70	ne.	4-5	8-4	30.04	29.96	0.01
16	29.99	76	69	84	76	64.0	63	nne.	6-4	3	30.05	29.96	0.00
17	29.97	76	69	83	75	65.0	65	ne.	4	4	30.06	29.97	0.06
18	29.96	75	70	83	72	66.5	68	ne.	4	4	30.00	29.93	0.07
19	29.96	76	70	83	74	68.5	77	ne.	3	7	29.99	29.92	0.27
20	29.97	75	71	84	72	67.5	71	ne.	3-4	5	30.01	29.94	0.16
21	29.95	77	71	83	73	68.0	73	ne.	3-5	4	30.01	29.93	0.03
22	29.94	76	71	84	75	68.3	72	ene.	3-4	5	29.99	29.92	0.03
23	29.93	76	70	84	73	67.7	70	ne.	3-2	2-4	29.98	29.91	0.00
24	29.92	77	70	85	75	66.7	68	ne.	3	2-4	29.96	29.91	0.01
25	29.94	76	70.5	85	75	67.5	70	ne.	3-4	4-2	29.99	29.90	0.05
26	29.94	76	69.5	84	73	66.7	69	ne.	3-4	4	29.98	29.91	0.00
27	29.94	77	69.5	84	75	66.7	67	ne.	3-4	2	29.98	29.90	0.01
28	29.98	76	69	84	74	66.0	67	nne.	4-3	4	30.01	29.94	0.05
29	30.00	77	69	84	75	65.7	65	ne.	4	4	30.04	29.96	0.00
30	30.03	77	68.5	84	76	65.0	64	ne.	4-5	3	30.09	30.01	0.01
31	29.98	77	69	83	76	64.5	63	ne.	4-5	5	30.06	29.97	0.06
Sums.													1.74
Means.	29.962	76.0	70.1	83.7	74.2	67.3	70.5		3-6	4.2	30.012	29.937	
Departure.	—.008					+1.3	+2.0			+0.2			—0.24

Mean temperature for August, 1902, (6+2+9+3)=78.5; normal is 77.7. Mean pressure for August, 1902, (9+3+2)=29.971; normal is 29.979.

*This pressure is as recorded at 1 p. m., Greenwich time. This temperature is observed at 6 a. m., local, or 4.31 p. m., Greenwich time. These values are the means of (6+9+2+9)÷4. ‡Beaufort scale.

TEXT-BOOKS AND WORKS OF REFERENCE FOR STUDENTS OF ELEMENTARY METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

Many inquiries regarding text-books and reference works suited to the wants of teachers and students of elementary meteorology have come to the Weather Bureau as incidental to the increasing attention paid to meteorology in the public schools and in many of the higher educational institutions. From time to time the writer has noted the titles of the works he has had occasion to suggest as answering some one or more of the various purposes and wants of the different inquirers.

As a result a number of titles have been brought together, which, with the addition of some others that occur as being of use in one or another way to teachers and students, constitute the appended list. Most of the titles named are those of works dealing with the general subject of meteorology, but whoever consults any one or more of them, especially those of recent issue, will find references to other works, not named in the list, which may be profitably consulted. References will also be found to papers and other publications dealing with the special problems of meteorology. In fact it is believed that this list will be found a sufficient ground, work or base of reference, for those desiring to prosecute more thoroughly the interesting study of meteorology. To those who desire the most elementary knowledge or wish to begin with the simplest recitals, the works of Archibald, Abercromby, Dickson, Chambers, Giberne, Harrington, Moore, and Scott are suggested. For intermediate use, the works of Davis, Russell, and Waldo, and for more advanced purposes the publications of Brillouin, Abbe, Ferrel, Bigelow, and Hann are recommended.

Abbe, Cleveland. Short Memoirs on Meteorological Subjects. Appendix to the Annual Report of the Smithsonian Institution for 1877, pp. 376–478. 8vo. Washington. 1878.

Abbe, Cleveland. Mechanics of the Earth's Atmosphere. (Smithsonian Miscellaneous Collections No. 843.) 324 pp. 8vo. Washington. 1891.

Abbe, Cleveland. Meteorological Apparatus and Methods. (Forming Part 2 of the Annual Report of the Chief Signal Officer for 1887.) 388 pp. 8vo. Washington. 1887.

Abercromby, Ralph. Weather: A popular exposition of the nature of weather changes from day to day. 491 pp. 12mo. London. 1887.

Allingham, William. Manual of Marine Meteorology. 195 pp. 12mo. London. 1900.

Angot, A. Traité élémentaire de météorologie. 423 pp. 4to. Paris. 1899.

Arago Francois. Meteorological Essays. 540 pp. 8vo. London. 1855.

Archibald, Douglas. Story of the Earth's Atmosphere. 194 pp. 16mo. New York. 1897.

Assmann, Richard and Berson, Arthur. Wissenschaftliche Luftfahrten. 3 Vol. 162 pp., 717 pp., 313 pp. 4to. Braunschweig. 1899–1900.

Bartholomew, J. G. and Herbertson, A. J. Atlas of Meteorology. Edited by Alexander Buchan. (Bartholomew's Physical Atlas, Vol. III.) 54 pp. 34 pl. 12 by 18 inches. (Comprising about 400 charts.) London. 1899.

Bebber, W. J. van. Hygienische Meteorologie. 340 pp. 8vo. Stuttgart. 1895.

Bebber, W. J. van. Lehrbuch der Meteorologie. 403 pp. 8vo. Stuttgart. 1890.

Bigelow, Frank Hagar. Storms, Storm-tracks, and Weather Forecasting. United States Weather Bureau Bulletin No. 20. 87 pp. 8vo. Washington. 1897.

Bigelow, Frank Hagar. Report on the International Cloud Observations. May 1, 1896, to July 1, 1897. 787 pp. 4to. Washington, 1900. (Forming Vol. 2 of the Report of the Chief of the Weather Bureau. 1898–1899.

Blanford, H. F. Indian Meteorologists Vade Mecum. Calcutta. 1877. 266 pp.

Blanford, H. F. A Practical Guide to the Climates and Weather of India, Ceylon, and Burmah and the Storms of the Indian Sea. 382 pp. 8vo. London. 1889.

Blodget, L. Climatology of the United States. 536 pp. 4to. Philadelphia. 1857.

Börnstein, R. Leitfaden der Wetterkunde. 189 pp. 8vo. 1901.

Brillouin, Marcel. Mémoires originaux sur la circulation général de l'atmosphère. 20, 163 pp. 8vo. Paris. 1900.

Buchan, Alexander. Handy Book of Meteorology. 383 pp. 12mo. London. 1868.

Buchan, Alexander. Report on atmospheric circulation. "Challenger Reports." Vol. II. 744 pp. 1889. 4to.

Chambers, George F. Story of the Weather. 232 pp. 24mo. London. 1897.

Coffin, J. H. Winds of the Globe, or the Laws of Atmospheric Circulation over the Surface of the Earth. 768 pp. 4to. Washington. 1876.

Davis, William Morris. Elementary meteorology. 367 pp. 8vo. Boston. 1898.

Deutsche Seewarte. Segelhandbuch für den Stillen Ozean. 928 pp. 4to. Hamburg. 1897.

53——3

Dickson, H. N. Meteorology. The elements of weather and climate. 192 pp. 12mo. London. 1893.

Dove, Heinrich Wilhelm. Law of Storms. 331 pp. 8vo. London. 1862.

Dunwoody, H. H. C. Summary of International Meteorological Observations. United States Weather Bureau Bulletin A. 10 pp. 59 charts. 18 by 24 inches. Washington. 1893.

Encyclopaedia Britannica. (9th edition.) Articles on Climate by Alexander Buchan and Meteorology by Alexander Buchan and Balfour Stewart. (See also the additions known as the 10th Edition, 1902.)

Espy, James. The Philosophy of Storms. 592 pp. 8 vo. Boston, 1841.

Espy, James. First Report on Meteorology to the Surgeon General of the United States Army. 4 pp. 4to. 1843; also 2d and 4th reports 1850, 1857.

Ferrel, William. A Popular Treatise on Winds: Comprising the general motions of the atmosphere, monsoons, cyclones, tornadoes, waterspouts, hailstorms, etc. 420 pp. 8vo. New York. 1889.

Ferrel, William. Recent Advances in Meteorology, systematically arranged in the form of a text-book. (Forming Part 2 of the Annual Report of the Chief Signal Officer for 1885.) 440 pp. 8vo. Washington. 1886.

Findlay, Alexander George. Directory for the Navigation of the North Pacific Ocean. 1346 pp. 8vo. London. 1886.

Findlay, Alexander George. Memoir, descriptive and explanatory of the Northern Atlantic Ocean. 892 pp. 8vo. London. 1879.

Findlay, Alexander George. Text-book of Ocean Meteorology. 259 pp. 8vo. London. 1887.

Flammarion, Camille. L'Atmosphère, Météorologie populaire. 808 pp. 4to. Paris. 1888.

——. Translated into English by J. Glaisher. 453 pp. 8vo. 1873.

Greely, Adolphus Washington. American Weather. A popular exposition of the phenomena of the weather, including chapters on hot and cold waves, blizzards, hailstorms, and tornadoes. 298 pp. 8vo. 1888.

Giberne, Agnes. Ocean of Air. Meteorology for beginners. 352 pp. 12mo. London. 1891.

Hann, J. Handbuch der Klimatologie. 2d Edition. 3 Vols. 8vo. Stuttgart, 1897.

——. English translation by R. DeC. Ward. (In Press.)

Hann, J. Atlas der Meteorologie. (Berghaus' Physikalischer Atlas Abtheilung III.) 12 pp. 12 plates. 8 by 13 inches. Gotha. 1887.

Hann, J. Lehrbuch der Meteorologie. 819 pp. 8vo. Leipzig. 1901.

Harrington, Mark W. About the Weather. 262 pp. 12mo. New York. 1899.

Henry, Alfred Judson. Rainfall of the United States. United States Weather Bureau Bulletin D. 58 pp. 4to. Washington. 1897.

Henry, Joseph. Papers on meteorology, in Vol. 2 of his Scientific Writings. Smithsonian Miscellaneous Collections. Vol. 30. 559 pp. 8vo. Washington. 1886.

Herbertson, Andrew John. Distribution of Rainfall over the Land. 70 pp. 8vo. London. 1901.

Houdaille, F. Météorologie agricole. 204 pp. 12mo. Paris. Not dated.

Johnson's New Universal Cyclopaedia, Article on Meteorology by Cleveland Abbe. 1878.

Johnson's Universal Cyclopaedia, Articles on Climate and Meteorology by M. W. Harrington. 1892.

Kämtz, Ludwig Friedrich. Lehrbuch der Meteorologie. 3 Vols. 526 pp., 615 pp., 563 pp. 8vo. Leipzig. 1831. Halle, 1832–36.

——. Vorlesungen über Meteorologie. 8vo. Halle, 1840.

——. Cours complet de météorologie, traduit et annoté par Ch. Martins. Paris. 1843.

——. Complete Course of Meteorology. Translated by C. V. Walker. 620 pp. London. 1845.

Kastner, K. W. G. Handbuch der Meteorologie. 3 Vols. 502 pp., 655 pp., 638 pp. Erlangen. 8vo. 1823–1830.

Loomis, Elias. Treatise on Meteorology. 313 pp. 8vo. New York. First edition 1870, last edition 1883.

Mann, Robert James, Laughton, John Knox, Strachan, Richard, Ley, W. Clement, Symons, George James, Scott, Robert H. Modern Meteorology. Six lectures under the auspices of the Meteorological Society in 1878.

Maryland Weather Service. [Special Publication.] Vol. 1. 566 pp. 4to. Baltimore. 1899.

Mohn, H. Grundzüge der Meteorologie. 5th Edition. 431 pp. 8vo. 1898.

Moore, John William. Meteorology, Practical and Applied. 466 pp. 12mo. London. 1891.

Paulsen, Adam. Nautisk Meteorologi til brug for Navigationsskoler. 112 pp. 8vo. 1899.

Piddington, Henry. The Sailor's Horn-Book for the Law of Storms. 6th edition. 1876.

Pinke, F. Leerboek der Maritieme Meteorologie en Oceanografie.

Plumandon, J. R. Les poussiéres atmosphériques. Leur circulation dans l'atmosphère et leur influence sur la santé. 130 pp. 16mo. Paris. Not dated. 176 pp. 8vo. Helder 1897.

Ramsey, William. Gases of the atmosphere. 240 pp. 8vo. London. 1896.

Reid, William. Attempt to develop the Law of Storms. 538 pp. 8vo. London. 1850.

Report of the International Meteorological Congress held at Chicago, 1893. Parts I-III. 793 pp. 8vo. Washington. 1894.

Roster, Giorgio. Aria atmosferica. 555 pp. 12mo. Milano. 1889.

Russell, Thomas. Meteorology. 290 pp. 8vo. New York. 1895.

Russia. Central Physical Observatory. Atlas climatologique de l'Empire de Russie. 89 ch. 15 by 20 inches. St. Petersburg. 1900.

Schmid, Ernst Erhard. Lehrbuch der Meteorologie. With atlas. 1025 pp. 8vo. Leipzig. 1860. Atlas, 21 charts. Leipzig. 1860.

Scholtz, Wm. C. South African Climate. 200 pp. 8vo. London. 1897.

Scott, Robert H. Elementary Meteorology. 4th edition. 424 pp. 12mo. 1887.

Scott, Robert H. Weather Charts and Storm Warnings. 3d edition. 235 pp. 12mo. London. 1887.

Silvado, Americo Brazilio. Instruccoes meteorologicas. 298 pp. 4to. Rio de Janeiro. 1900.

Solly, S. Edwin. Handbook of Medical Climatology. 479 pp. 8vo. Philadelphia. 1897.

Supan, Alexander. Verteilung des Niederschlags auf der festen Erdoberflache. 107 pp. 4to. Gotha. 1898.

Trabert, Wilhelm. Meteorologie. 150 pp. 24mo. Leipzig. 1896.

Voeikov, Aleksandr Ivanovich. Klimate der Erde. 2 parts. 396 pp., 445 pp. 8vo. Jenna. 1887.

Waldo, Frank. Elementary Meteorology. 373 pp. 12mo. New York. 1896.

Waldo, Frank. Modern Meteorology. 383 pp. 8vo. New York. 1893.

Ward, Robert DeCourcy. Practical Exercises in Elementary Meteorology. 212 pp. 8vo. Boston. 1899.

Weber, F. Parkes, and Hinsdale, Guy. Climatology, Health Resorts, and Mineral Springs. Vols. 3 and 4 of System of Physiologic Therapeutics. S. Solis-Cohen, Editor. Philadelphia. 1901.

SOME RECENT WORKS ON PHYSICAL GEOGRAPHY, IN WHICH WILL BE FOUND MUCH RELATING TO METEOROLOGY AND CLIMATE.

Davis, W. M. Physical Geography. 446 pp. 12mo. Boston. 1899.

Hughes, William. A Class-Book of Physical and Astronomical Geography. 332 pp. 12mo. London. 1899.

Mill, Hugh Robert. The Realm of Nature, an outline of Physiography. 379 pp. 12mo. New York. 1894.

Tarr, Ralph S. Elementary Physical Geography. 509 pp. 12mo. New York. 1897.

NOTES AND EXTRACTS.

EXPERIMENTAL AGRICULTURE AT METEOROLOGICAL STATIONS.

According to the Experiment Station Record, Vol. XIII, No. 8, page 708, the system of agricultural meteorological stations in Russia is especially worthy of commendation. In 1897 the Russian Department of Agriculture and Imperial Domain established a system of stations for the purpose of bringing observations on meteorology and agricultural phenomena into closer relationship, with a view to determining more definitely the effect of various meteorological conditions on crop production:

Each meteorological station has connected with it a series of plats, not exceeding 1 deciatine (2.7 acres) each in area, on which various crops are grown. Adjacent to the plats are arranged the meteorological apparatus for measuring the temperature and humidity of the air, intensity of the sunlight, direction and velocity of the wind, etc. On the plats are installed a rain gage, thermometers for determining the temperature of the soil at the surface and at different depths, and likewise apparatus for determining the humidity of the soil and measuring the snowfall. Phenological observations are made systematically on the crops under cultivation, and a record is kept of the different stages in the development of the plant, of all the work done on the plats, any injuries caused by meteorological or other factors, and the final yields of grain and straw. In addition to these observations some stations study the underground waters, the intensity of the sun's energy, the relations of the atmospheric conditions to cultivation of the soil, and similar matters.

The stations differ in their equipment; those of the second class have only the more common apparatus, and their studies are therefore of a more limited character.

The agricultural meteorological stations are for the most part connected with the experiment stations, experimental fields, and agricultural schools, although some are located on private estates. In addition to the stations there are a large number of "observation plats," which are provided with simpler meteorological apparatus, some having, also, apparatus for the determination of soil moisture.

Early in 1901, when the official report was prepared, there were 65 of these agricultural-meteorological stations, 21 of which were of the first class and 44 of the second class, and 113 observation plats, 90 of which were provided with apparatus for studying soil moisture in addition to the atmospheric conditions. The meteorological bureau, in addition to its work in agricultural meteorology, is elaborating plans for weather forecasting, although little has been done in that direction as yet.

The list of publications of the Meteorological Bureau of the Russian Department of Agriculture includes papers on the practical importance of agricultural meteorology, instructions for making the simplest agricultural-meteorological observations, an article on the relation of the cereal crop to sun spots and meteorological factors, and a review of the observations of the agricultural-meteorological stations of central Russia, together with a number of more popular publications on the relation of meteorological conditions to crop production.

This is evidently the most extensive and systematic series of institutions for the study of agricultural meteorology that has been inaugurated by any country, and its work will be followed with much interest. If nothing more is done than to work out satisfactory methods and a basis for correlating the meteorological and soil conditions with the production of staple crops, the results will be of widespread importance, and will pave the way for similar studies by the experiment stations in various countries.

MOUNTAIN STATIONS FOR METEOROLOGY.

The observatory on the summit of Ben Nevis and the corresponding low-level observatory at Fort William were established in 1883 at a time when the importance of obtaining systematic records of what is called the free atmosphere, at a considerable elevation above sea level was felt as one of the most pressing needs of meteorology. Since those days the employment of the kite and the sounding balloon has enabled us to attain still greater elevations than were considered possible at that time. But these two great improvements must always be very much restricted in their application to meteorology, they can not give us continuous records. The latter are still needed and will in fact continue to be necessary for generations to come, and their records can only be properly interpreted and utilized when combined with the occasional records that are obtained by the use of the kite and balloon and by the study of the upper clouds.

Meteorology considered as a system of research into the laws of the motions of the atmosphere is not a matter that can be prosecuted successfully by any short-lived spasmodic or discontinuous system of work, it must be undertaken by permanent cooperation and the long-continued labors of all nations; the important mountain observatories should especially be maintained intact from generation to generation without any thought of discontinuing their work. Each pair of high and low stations is really of more importance to meteorology than any dozen stations at sea level. The time will doubtless come when Mount Washington, Pikes Peak, and numerous other high stations in this country will be permanently occupied. The reports from both of these stations were frequently of great use to the Editor in his early forecast work, and it is only a question of time when we shall learn how to make use of them on every occasion. Meanwhile we quote the following remarks by Sir Arthur Mitchell, Honorary Secretary of the Scottish Meteorological Society with reference to the Ben Nevis Observatory:

In the work of the two Ben Nevis observatories, the directors did all

that was possible to render the observations useful in forecasting. They could not themselves issue forecasts. This, indeed, can only be done from a central office receiving information by wire, at short intervals, from a great many stations, near and remote.

The directors started in 1883 with the intention of performing a big and costly experiment in atmospheric physics, which, in their opinion, ought to cover a sun-spot period, that is, from eleven to twelve years. This experiment they have been able to complete by the aid of public generosity. For the first seven years after 1883, when the observatory at the top of Ben Nevis was opened, there were no hourly observations at sea level for purposes of comparison, so that the experiment began in a complete form only twelve years ago, 1890, when the low-level observatory at Fort William was also opened.

It will be borne in mind that the directors consist of men of high scientific standing—no higher could be found—and the members of the Scottish Meteorological Society should know that these gentlemen continue to hold the opinion expressed at the meeting of the British Association, at Manchester in 1887, namely, "That the Ben Nevis observations are of the highest utility in the development of meteorology and in framing forecasts of storms and weather for the British Islands."

CORRIGENDA.

Page 370, column 1, line 16, for "1893" read "May, 1894."
Page 370, column 1, line 20, for "1895" read "December, 1896."

THE WEATHER OF THE MONTH.

By W. B. STOCKMAN, Forecast Official, in charge of Division of Records and Meteorological Data.

CHARACTERISTICS OF THE WEATHER FOR AUGUST.

The amount of sunshine was normal in the upper Lake region; above normal in the Atlantic and west Gulf States, and the southern slope, southern and northern Plateau and north Pacific coast regions; elsewhere, below normal.

The relative humidity was normal in the middle slope and Middle Atlantic States; below in New England, Florida Peninsula, the South Atlantic and Gulf States, and the southern slope, southern Plateau, and middle and north Pacific coast regions, and above normal in the remaining districts.

Generally the precipitation was above the normal in North Dakota, the Missouri and upper Mississippi valleys, and the middle slope and southern Plateau regions; elsewhere it was below, except in the southern Pacific district where it was normal.

Temperatures were normal in the Ohio Valley and Tennessee; they were below in New England, the Middle and South Atlantic States, Lake regions, North Dakota, the Missouri and upper Mississippi valleys, and the Plateau and southern Pacific regions, and above in the remaining districts.

PRESSURE.

The distribution of monthly mean pressure is shown graphically on Chart IV and the numerical values are given in Tables I and VI.

The highest mean pressure obtained on the north Pacific coast, with readings slightly above 30.05 inches; and an area of somewhat lower mean readings overlay the upper Ohio Valley and the Lakes Huron and Michigan region. The lowest mean readings, generally somewhat below 29.85 inches, occurred over the southwestern portion of the country. The pressure was above the normal in the Pacific coast, Plateau and upper Lake regions and the upper Mississippi Valley, the greatest departures being + .08 inch; generally elsewhere the pressure was below the normal in values somewhat less than in the area of excess. Over the southeastern half of the United States and on the middle Pacific coast the pressure diminished from that of the preceding month, and generally by values ranging from —.05 inch to —.09 inch; elsewhere it increased, the area of greatest departure overlying the western part of the upper Lake region and upper Mississippi Valley, where the changes amounted to + .05 inch to + .07 inch.

TEMPERATURE OF THE AIR.

The distribution of monthly mean surface temperature, as deduced from the records of about 1,000 stations, is shown on Chart VI.

Generally the position of all isotherms was to the southward of their location in August, 1901, excepting in the Pacific coast districts where their trend was about the same, and in southeastern California and the extreme southwest where the mean temperatures were considerably lower during August, 1902. Maximum temperatures of 90°, or higher, occurred, except in the northeastern and north-central portions of the country, in scattered sections of the mountainous districts of the Virginias,

in the northern Plateau region, and along the Pacific coast; of 100°, or higher, in the southern portion of the South Atlantic States, in the Gulf States, southern and middle slope, southern Plateau, and the southeastern and extreme southern part of the middle Plateau regions; and 110°, or higher, in southeastern California and western Arizona. Minimum temperatures below 50° occurred generally over the northern half of the United States, in the northern portion of the southern slope and in the middle and northern slope, and the Plateau and Pacific coast districts, except in the interior of California. Temperatures of 32°, or lower, occurred in scattered portions of the Northwestern States. The temperature was above the normal from the interior of the South Atlantic States westward to the central parts of Arizona and Utah, and northward to central Nebraska, in north-central Montana, and in portions of the Pacific coast districts. The greatest departures, +4° to +5°, occurred in the central part of the east Gulf States, the northwestern part of the west Gulf States, and the northern part of the southern slope and southern part of the middle slope regions.

The average temperature for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	8	65.1	—1.6	+ 2.4	+0.3
Middle Atlantic	12	71.9	—1.3	— 3.8	—0.5
South Atlantic	10	78.5	—0.1	— 6.8	—0.8
Florida Peninsula.............	8	81.9	+0.6	— 3.6	—0.4
East Gulf.....................	9	82.9	+3.2	+ 0.5	+0.1
West Gulf	7	83.5	+2.9	+ 5.3	+0.7
Ohio Valley and Tennessee......	11	74.9	0.0	— 6.0	—0.8
Lower Lake	8	67.3	—2.2	— 2.6	—0.3
Upper Lake	10	64.0	—1.7	+11.4	+1.4
North Dakota	8	65.2	—1.1	+15.4	+1.9
Upper Mississippi Valley........	11	71.0	—1.8	+ 2.7	+0.3
Missouri Valley	11	72.2	—0.8	+ 7.5	+0.9
Northern Slope	7	68.1	+0.3	+10.7	+1.3
Middle Slope	6	77.6	+3.0	+10.3	+1.3
Southern Slope	6	82.6	+4.0	+10.6	+1.3
Southern Plateau	13	75.0	—1.2	— 2.8	—0.4
Middle Plateau...............	9	68.8	—1.5	+ 1.3	+0.2
Northern Plateau	12	66.3	—1.7	+ 1.5	+0.2
North Pacific.................	7	61.9	+0.2	+ 1.9	+0.2
Middle Pacific................	5	65.0	+0.3	— 1.7	-0.2
South Pacific	4	69.5	—2.0	— 4.5	—0.6

In Canada.—Prof. R. F. Stupart says:

The mean temperature of August was slightly above average in portions of Saskatchewan and Manitoba, and also in New Brunswick and Quebec bordering on the Gulf of St. Lawrence, but over all other portions of the Dominion departures from average were negative. In Northern British Columbia the departure was between 3° and 6° below, and in Ontario from 1° to 3° below.

PRECIPITATION.

The rainfall was, as a rule, unevenly distributed, and generally over the greater portion of the country deficient; the

greatest deficiencies occurred in the South Atlantic and Gulf States, yet at scattered stations within the East Gulf and South Atlantic States decided excesses of rainfall occurred, the total amounting to over eleven inches at some places. The greatest excesses of rainfall are reported from the central and lower Missouri and cental Mississippi valleys, numerous stations within those districts reporting from five to eleven and one-half inches during the month. Practically no rainfall was reported from south-central Texas and southern California.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percent-age of normal.	Current month.	Accumu-lated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	8	2.44	64	−1.4	− 2.3
Middle Atlantic	12	3.31	73	−1.2	− 3.9
South Atlantic	10	4.50	68	−2.1	−11.1
Florida Peninsula	8	5.40	79	−1.4	− 2.8
East Gulf	9	3.05	54	−2.6	−12.6
West Gulf	7	0.47	13	−3.1	− 7.7
Ohio Valley and Tennessee	11	2.10	60	−1.4	− 8.0
Lower Lake	8	1.38	46	−1.6	− 0.3
Upper Lake	10	1.87	63	−1.1	− 1.9
North Dakota	8	1.75	121	+0.3	+ 1.4
Upper Mississippi Valley	11	5.00	167	+2.0	− 1.9
Missouri Valley	11	4.07	137	+1.1	+ 0.4
Northern Slope	7	0.77	66	−0.4	+ 0.1
Middle Slope	6	3.09	124	+0.6	+ 2.0
Southern Slope	6	1.44	62	−0.9	+ 1.1
Southern Plateau	13	1.75	113	+0.2	− 1.6
Middle Plateau	8	0.21	34	−0.4	− 1.4
Northern Plateau	12	0.44	81	−0.1	− 0.3
North Pacific	7	0.46	53	−0.4	+ 3.0
Middle Pacific	5	T.	0	−0.1	+ 1.4
South Pacific	4	T.	100	0.0	− 0.4

In Canada.—Professor Stupart says:

In southern Alberta, as for several months past, the rainfall was excessive, but over the Northwest Territories generally, it was less than average, as it also was in British Columbia. In Ontario it was for the most part below average, but from Montreal eastward it was well up to, or in excess of, average, especially in eastern Nova Scotia, where there were some extensive rainfalls during the first half of the month.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 6, 15. Arizona, 4, 9, 11, 25. California, 13. Colorado, 3, 11, 12, 14, 15, 20, 21, 22, 23, 25, 28, 30, 31. Connecticut, 27. Florida, 28. Georgia, 4, 15, 16, 21. Idaho, 12, 16. Illinois, 4, 7, 10, 14, 15, 17. Indiana, 3, 20. Iowa, 1, 2, 3, 4, 5, 9, 10, 14, 15, 17, 18, 19, 20. Kansas, 8, 9, 10, 18, 20, 21, 23, 29. Kentucky, 5, 6, 21. Maine, 8, 22, 23. Maryland, 1, 3, 4, 24, 27. Massachusetts, 4, 23. Michigan, 2, 6, 21. Minnesota, 1, 9, 10, 16, 20, 29. Mississippi, 20. Missouri, 3, 5, 8, 9, 10, 17, 18. Montana, 7, 8, 12, 13, 14, 16, 17, 25, 26. Nebraska, 4, 5, 7, 8, 9, 10, 18, 20, 21, 22, 25, 30. Nevada, 7, 8, 10, 11. New Hampshire, 8, 22, 23, 25. New Jersey, 3, 21, 24. New Mexico, 1, 6, 7, 21, 22, 24, 28. New York, 3, 16, 22. North Carolina, 6, 14, 21, 22. North Dakota, 1, 18, 19, 25, 31. Ohio, 2, 3, 6, 7, 20, 29, 30. Oklahoma, 7, 19. Oregon, 14. Pennsylvania, 3, 6, 19, 20, 21, 24, 28. South Carolina, 4, 5, 15, 20, 21, 22. South Dakota, 1, 17, 18, 19, 21. Tennessee, 4, 6, 15, 18, 19, 20, 21. Texas, 28. Utah, 3, 12, 28. Virginia, 4, 6, 9, 11, 15, 21, 28. West Virginia, 2, 3, 9, 20. Wisconsin, 7. Wyoming, 7, 28.

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

The averages for the various districts, with departures from the normal, are shown in the table below:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	4.8	− 0.2	Missouri Valley	5.4	+ 1.3
Middle Atlantic	4.6	− 0.4	Northern Slope	4.0	+ 3.0
South Atlantic	4.7	− 0.5	Middle Slope	4.0	+ 0.2
Florida Peninsula	4.7	− 0.5	Southern Slope	2.8	− 2.0
East Gulf	5.0	+ 0.1	Southern Plateau	3.3	− 0.1
West Gulf	2.5	− 1.9	Middle Plateau	3.3	+ 1.1
Ohio Valley and Tennessee	4.7	+ 0.2	Northern Plateau	2.7	− 0.3
Lower Lake	4.8	+ 0.3	North Pacific	3.6	− 0.3
Upper Lake	4.8	0.0	Middle Pacific	3.6	+ 0.8
North Dakota	4.4	+ 0.5	South Pacific	3.1	+ 0.6
Upper Mississippi Valley	5.5	+ 1.4			

HUMIDITY.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	80	− 2	Missouri Valley	75	+ 8
Middle Atlantic	75	0	Northern Slope	58	+ 7
South Atlantic	79	− 3	Middle Slope	61	0
Florida Peninsula	76	− 5	Southern Slope	55	− 9
East Gulf	75	− 5	Southern Plateau	41	− 7
West Gulf	73	− 1	Middle Plateau	37	+ 5
Ohio Valley and Tennessee	73	+ 2	Northern Plateau	44	+ 1
Lower Lake	74	+ 4	North Pacific	73	− 5
Upper Lake	75	+ 1	Middle Pacific	67	− 1
North Dakota	71	+ 8	South Pacific	69	+ 6
Upper Mississippi Valley	76	+ 6			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Atlanta, Ga	19	51	n.	Kansas City, Mo	10	55	nw.
Cape Henry, Va	11	59	nw.	Lexington, Ky	21	52	w.
Do	16	51	ne.	Marquette, Mich	31	53	w.
Denver, Colo	9	52	n.	Mount Tamalpais, Cal	15	50	w.
El Paso, Tex	12	56	sw.	Do	16	63	nw.
Fort Smith, Ark	31	64	w.	Do	30	51	nw.
Hatteras, N. C	3	52	n.	New York, N. Y	11	56	nw.
Do	6	52	w.	Norfolk, Va	11	54	nw.
Huron, S. Dak	1	58	s.	Point Reyes Light, Cal.	16	56	nw.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 6,524 thunderstorms were received during the current month as against 5,891 in 1901 and 8,266 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country was most numerous were: 10th, 406; 20th, 329; 3d, 314; 5th, 297.

Reports were most numerous from: Missouri, 500; Iowa, 410; Nebraska, 360; Kansas, 349.

Auroras.—The evenings on which bright moonlight must

have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz: 15th to 23d.

In Canada: Thunderstorms were reported as follows: St. John, N. B., 4; Halifax, 5; Grand Manan, 8; Yarmouth, 8, 16, 23; Charlottetown, 4, 9; Father Point, 3; Quebec, 3, 6, 7, 8, 26; Montreal, 1, 21; Ottawa, 4, 26; Kingston, 3, 21; Toronto, 1, 3, 5; White River, 2, 3, 5, 8, 26; Port Stanley, 5, 7; Sau-geen, 31; Parry Sound 3, 31: Port Arthur, 2, 5, 17; Winnipeg, 4, 6, 18, 28, 31; Minnedosa, 1, 16, 18, 31; Qu'Appelle, 1, 26, 28; Medicine Hat, 4, 13, 17, 18, 27; Swift Current, 3, 7, 15, 17, 26; Calgary, 16; Banff, 27; Prince Albert, 1, 12; Battleford, 1, 24; Barkerville, 16; Hamilton, Bermuda, 4, 5, 13, 17, 18, 23, 25, 26, 27, 28.

An aurora was reported from Swift Current, Assin., on the 31st.

DESCRIPTION OF TABLES AND CHARTS.

By W. B. STOCKMAN, Forecast Official, in charge of Divison of Records and Meteorological Data.

Table I gives, for about 145 Weather Bureau stations making two observations daily and for about 25 others making only one observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation, the total depth of snowfall, and the mean wet-bulb temperatures. The altitudes of the instruments above ground are also given.

Table II gives, for about 2,700 stations occupied by voluntary observers, the highest maximum and the lowest minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station, the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (. . . .).

Table III gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions based on these two observations only and without considering the velocity of the wind. The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I. By adding the four components for the stations comprised in any geographical division the average resultant direction for that division can be obtained.

Table IV gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table V gives a record of rains whose intensity at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes	5	10	15	20	25	30	35	40	45	50	60	80	100	120
Rates per hour (ins.)	3.00	1.80	1.40	1.29	1.08	1.00	0.94	0.90	0.86	0.84	0.75	0.69	0.54	0.50

In the northern part of the United States, especially in the colder months of the year, rains of the intensities shown in the above table seldom occur. In all cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest rainfall of any single storm has been given, also the greatest hourly fall during that storm.

Table VI gives, for about 30 stations furnished by the Canadian Meteorological Service, Prof. R. F. Stupart, director, the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

Table VII gives the heights of rivers referred to zeros of gages; it is prepared by the Forecast Division.

NOTES EXPLANATORY OF THE CHARTS.

Chart I, tracks of centers of high areas, and Chart II, tracks of centers of low areas, are constructed in the same way. The roman numerals show number and chronological order of highs (Chart I) and lows (Chart II). The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the observations at 8 a. m. and 8 p. m., seventy-fifth meridian time. Within each circle is also given (Chart I) the highest barometric reading and (Chart II) the lowest barometric reading at or near the center at that time, and in both cases as reduced to sea level and standard gravity.

Chart III.—Total precipitation. The scale of shades showing the depth of rainfall is given on the chart itself. For isolated stations the rainfall is given in inches and tenths, when appreciable; otherwise, a "trace" is indicated by a capital T, and no rain at all by 0.0.

Chart IV.—Sea-level pressure and resultant surface winds. The pressures have been reduced to sea level and standard gravity by the method fully described by Prof. Frank H. Bigelow on pages 13–16 of the REVIEW for January, 1902. The pressures have also been further reduced to the mean of the twenty-four hours by the application of a suitable correction, to the mean of the 8 a. m. and 8 p. m. readings, at stations taking two observations daily, and to the 8 a. m. or 8 p. m. observation, respectively, at stations taking but a single observation. The diurnal corrections so applied will be found in Table 27, Volume II, Annual Report of the Chief of Weather Bureau, 1900–1901, pp. 140–164.

The isotherms on the sea-level plane have been constructed by means of the data summarized in chapter 8 of Professor Bigelow's Report on the Barometry of the United States and Canada, which can be found in the Annual Report of the Chief of the Weather Bureau for 1900–1901, Volume II. The correction $t_0 - t$, temperature on the sea-level plane minus the station temperature, by Table 48 of the Barometry Report, is added to the observed surface temperature to obtain the adopted sea-level temperature. On account of excessive local abnormalities of temperature in the great California Valley, between the Coast Range and the Sierra Nevada Mountains, the stations in that valley have been ignored in drawing the lines of equal temperature.

The wind directions are the computed resultants of observations at 8 a. m. and 8 p. m. daily. The resultant duration is shown by figures attached to each arrow.

Chart V.—Hydrographs for seven principal rivers of the United States, prepared by the Forecast Division.

Chart VI.—Surface temperatures; maximum, minimum, and mean of these. Lines of equal monthly mean temperature in red; lines of equal maximum temperature in black; and lines of equal minimum temperature (dotted) also in black.

Chart VII.—Percentage of sunshine. The average cloudiness at each Weather Bureau station is determined by numerous personal observations during the day. The difference between the observed cloudiness and 100, it is assumed, represents the percentage of sunshine, and the values thus obtained have been used in preparing Chart VII.

Chart VIII.—West Indian monthly isobars, isotherms, and resultant winds.

TABLE I.—*Climatological data for Weather Bureau Stations, August, 1902.*

Stations	Barom. above sea level	Thermom. above ground	Anemom. above ground	Actual press., red. to mean 24 hrs	Sea level, red. to mean 24 hrs	Press. dep. from normal	Mean max.+min.÷2	Temp. dep. from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range	Mean wet therm.	Mean temp. dew-point	Mean rel. humidity	Precip. total	Precip. dep. from normal	Days with .01+	Total movement, miles	Prevailing direction	Max vel. miles per hour	Max vel. direction	Date	Clear days	Partly cloudy days	Cloudy days	Avg. cloudiness tenths	Total snowfall
New England.							**65.1**	**—1.6**																						**4.8**	
Eastport	76	69	74	29.82	29.89	—.07	69.6	0.0	78	9	68	48	17	53	24	55	53	80	2.44	—1.4	13	5,289	w.	36	e.	23	9	10	12	5.9	
Portland, Me.	103	81	117	29.80	29.91	—.07	63.6	—3.2	79	4	71	50	17	56	25	58	54	75	4.36	+0.6	11	5,244	nw.	28	n.	23	12	7	12	5.4	
Northfield	876	15	65	29.02	29.96	—.02	60.2	—2.7	84	1	71	39	16	49	33	57	55	86	4.06	+0.1	16	4,687	s.	36	sw.	1	3	17	11	6.5	
Boston	125	115	181	29.80	29.93	—.06	67.6	—1.5	85	2	75	53	13	60	23	62	58	74	2.20	—2.2	9	6,251	w.	29	w.	11	14	10	7	4.3	
Nantucket	12	43	85	29.93	29.94	—.05	66.7	—1.0	80	27	72	56	1	61	20	62	60	83	0.27	—2.9	7	7,407	sw.	36	nw.	12	9	20	2	4.9	
Block Island	26	11	60	29.92	29.95	—.04	66.9	—1.1	80	27	73	54	14	61	19	63	61	84	1.42	—2.0	7	8,758	sw.	37	sw.	11	15	14	2	3.4	
Narragansett		10					66.8	—1.6	82	*	76	41	14	58	35				1.81	—2.0	6		w.				21	6	4		
New Haven	106	117	140	29.83	29.94	—.05	68.7	—1.3	87	4	78	52	13	60	26	62	59	75	2.14	—3.0	11	5,321	nw.	26	se.	6	18	9	4	3.2	
Mid. Atlantic States.							**71.0**	**—1.3**										**75**	**5.31**	**—1.2**										**4.6**	
Albany	97	102	115	29.85	29.95	—.03	68.2	—2.3	86	31	78	50	17	58	26	61	58	76	3.98	—0.1	12	4,338	s.	26	se.	21	12	10	9	5.0	
Binghamton	875	79	90	29.04	29.96	—.03	65.6	—1.6	89	31	76	44	13	55	31				2.13	—1.9	15	3,515	ne.	32	nw.	3	2	23	6	5.5	
New York	314	108	330	29.62	29.95	—.05	71.4	—0.9	86	11	79	56	23	64	20	64	60	73	3.29	—1.4	10	7,766	nw.	56	nw.	11	12	13	6	4.8	
Harrisburg	374	94	104	29.58	29.98	—.03	70.6	—1.5	91	3	80	51	17	61	25				2.26	—2.2	6	3,682	w.	36	ne.	3	11	16	4	4.8	
Philadelphia	117	168	184	29.85	29.97	—.03	73.0	—0.8	89	2	81	56	17	64	22	64	60	69	2.34	—2.0	8	6,468	s.	31	nw.	6	11	15	5	4.9	
Scranton	805	111	119	29.12	29.97	—.03	67.4		88	3	78	47	17	57	30	61	58	76	3.28		10	4,085	ne.	31	n.	19	7	15	9	5.6	
Atlantic City	52	39	48	29.91	29.94	—.04	71.0	—0.8	86	6	77	54	17	65	21	67	65	82	3.36	—1.4	8	5,399	sw.	29	w.	3	10	21	0	4.1	
Cape May	17	47	51	29.97	29.99	—.01	71.8	—1.4	85	8	77	54	13	66	19	67			3.58	—1.2	8	4,864	s.	24	e.	3	15	15	1	3.6	
Baltimore	123	68	82	29.83	29.96	—.05	73.6	—1.3	91	3	83	55	17	64	26	66	62	71	4.31	+0.3	7	4,606	sw.	30	sw.	6	9	17	5	4.8	
Washington	112	59	76	29.85	29.97	—.04	72.6	—2.0	90	11	83	51	17	62	30	66	62	73	1.85	—2.1	9	3,484	s.	34	nw.	6	11	16	4	4.1	
Cape Henry		5	58	29.93	29.95	—.04	74.8	—1.6	93	8	81	60	18	69	22				4.41	—1.1	10	8,506	sw.	59	nw.	11	14	11	6	4.3	
Lynchburg	681	83	88	29.24	29.97	—.03	74.7	—0.6	94	3	85	56	25	64	29	67	64	74	3.69	—0.3	7	2,490	e.	27	w.	4	12	13	6	4.5	
Norfolk	91	102	111	29.88	29.97	—.03	76.0	—0.6	96	4	84	58	18	68	25	69	66	79	4.51	—1.6	11	5,413	s.	54	nw.	11	18	10	3	4.7	
Richmond	144	82	90	29.83	29.98	—.03	75.0		96	4	85	56	17	65	28				3.10		7	3,260	n.	26	nw.	11	12	13	6	4.7	
S. Atlantic States.							**76.5**	**—0.1**										**79**	**4.50**	**—2.1**										**4.7**	
Charlotte	773	68	76	29.17	29.99	—.03	76.8	+0.7	95	21	86	61	29	68	27	69	66	77	3.74	—1.6	10	3,682	sw.	42	w.	6	10	14	7	5.3	
Hatteras	11	12	47	29.97	29.98	—.02	77.0	—0.4	87	11	82	63	26	72	18	72	70	81	4.04	—2.3	11	8,813	sw.	52	w.	6	15	10	6	4.3	
Kittyhawk	8	12	39				76.2	—1.4	92	6	82	63	23	70	24				6.38	—0.5	9	8,936	sw.				21	6	4	3.4	
Raleigh	376	93	101	29.58	29.95	—.06	77.0	+1.3	97	4	87	59	18	67	26	68	65	74	2.76	—3.4	9	3,767	sw.	30	nw.	21	8	15	8	5.3	
Wilmington	78	82	90	29.88	29.95	—.05	77.4	—0.8	94	3	86	61	18	69	24	71	69	81	2.35	—5.1	13	5,331	sw.	40	sw.	21	9	20	2	4.7	
Charleston	48	14	92	29.94	29.99	—.02	80.4	—0.1	99	20	87	69	23	74	23	73	71	79	3.04	—4.6	11	7,464	sw.	45	nw.	20	4	24	3	5.4	
Columbia	351	114	122	29.61	29.98	—.03	78.5	—1.3	99	21	88	63	24	69	26	71	69	79	7.14	+0.3	16	4,702	ne.	42	ne.	15	7	16	8	5.7	
Augusta	180	89	97	29.78	29.97	—.04	79.6	+0.2	100	21	89	63	31	70	26	71	69	76	4.47	—0.7	14	3,719	s.	36	nw.	10	16	10	5	4.4	
Savannah	65	79	89	29.91	29.98	—.03	81.2	+0.9	101	21	89	69	30	73	24	75	73	87	6.30	—1.4	13	5,274	sw.	36	ne.	23	12	16	3	4.4	
Jacksonville	43	101	129	29.93	29.97	—.04	81.0	—0.1	98	22	89	66	26	73	23	74	72	80	4.74	—1.8	15	6,989	sw.	41	nw.	23	13	12	6	4.4	
Florida Peninsula.							**82.6**	**+0.5**										**76**	**4.87**	**—1.5**										**4.7**	
Jupiter	28	10	30	29.96	29.98	—.02	82.6	+1.6	90	23	89	73	5	76	18	76	74	79	1.91	—3.6	16	5,178	w.	30	w.	24	14	16	1	4.1	
Key West	22	43	50	29.96	29.97	—.01	83.4	—0.5	91	22	88	73	31	79	15	76	73	71	5.35	+0.6	10	4,163	e.	30	nw.	25	12	16	3	4.5	
Tampa	34	60	67	29.95	29.97	—.03	81.7	+0.3	94	18	90	68	26	74	21	73	73	79	7.35	—1.4	15	4,120	ne.	30	sw.	8	7	17	7	5.4	
East Gulf States.							**82.9**	**+3.2**										**75**	**3.05**	**—2.6**										**5.0**	
Atlanta	1,174	190	216	28.77	29.98	—.03	79.2	+2.7	97	4	89	62	28	70	26	69	65	71	1.66	—3.1	10	7,113	nw.	51	n.	19	8	16	7	5.3	
Macon	370	93	99	29.59	29.99	—.02	80.2		100	14	91	66	31	71	28				1.84		8	3,702	s.	34	s.	4	8	14	9	5.5	
Pensacola	56	78	96	29.92	29.98	—.00	82.6	+2.2	97	23	88	72	2	77	19		75	78	3.16	—5.2	10	6,693	w.	36	sw.	22	12	16	3	4.5	
Mobile	57	88	96	29.92	29.98	—.00	83.0	+2.7	97	23	90	72	7	76	21	75	73	78	3.30	—3.6	9	4,650	sw.	30	se.	5	11	15	5	5.0	
Montgomery	223	100	112	29.72	29.94	—.05	83.2	+3.4	100	21	93	71	11	74	25	73	70	72	2.53	—1.6	10	4,540	sw.	32	nw.	11	11	14	6	5.5	
Meridian	375	84	93	29.57	29.96	—.02	83.2	+4.4	99	19	93	64	8	71	29				3.47	—1.0	10	3,362	sw.	22	sw.	1	10	19	2	4.5	
Vicksburg	247	62	74	29.68	29.94	—.04	83.8	+3.7	99	17	93	71	26	75	24	75	72	76	1.03	—2.5	6	3,766	sw.	18	nw.	28	17	10	4	3.6	
New Orleans	51	88	121	29.92	29.97	—.01	84.4	+2.9	98	17	92	71	3	76	21	76	74	78	2.93	—3.2	10	5,139	sw.	30	nw.	3	4	18	9	6.2	
Port Eads		27					85.0	+3.4	97	*	92	72	4	78	18				6.34	—0.2	8										
West Gulf States.							**83.5**	**+2.9**										**73**	**0.47**	**—3.1**										**2.5**	
Shreveport	249	77	84	29.69	29.94	—.03	85.2	+3.9	98	17	95	71	1	76	22	76	73	73	0.02	—2.2	1	3,306	sw.	16	ne.	6	21	10	0	2.8	
Fort Smith	457	79	94	29.46	29.92	—.05	82.4	+4.7	101	26	93	64	7	72	30	72	67	69	3.07	—0.7	3	5,374	e.	64	w.	31	16	14	1	3.2	
Little Rock	357	93	100	29.58	29.95	—.03	81.4	+2.3	97	16	90	67	25	72	24	73	70	73	0.19	—4.0	3	4,098	sw.	26	nw.	6	16	14	1	3.1	
Corpus Christi	20	48	53	29.93	29.95	+.02	83.1	+1.7	92	27	89	73	7	78	18	77	76	83	T.	—3.1	0	8,789	se.	29	se.	9	26	5	0	2.2	
Fort Worth	670	106	114	29.25	29.94	—.00	86.7		103	27	98	72	28	76	26				T.		0	7,711	n.	24	s.	8	29	2	0	0.5	
Galveston	54	106	112	29.93	29.94	—.01	83.6	+0.4	89	31	87	77	8	80	11	77	75	78	0.00	—5.5	0	6,731	s.	22	s.	10	24	7	0	2.6	
Palestine	510	73	79	29.43	29.94	—.01	83.0	+2.6	96	27	92	72	9	74	21	74	72	74	T.	—2.7	0	3,900	sw.	11	s.	10	24	7	0	2.3	
San Antonio	701	80	91	29.21	29.91	—.02	85.8	+3.6	100	27	97	72	7	74	26	73	68	62	0.60	—3.8	0	5,005	se.	24	se.	18	18	11	2	3.5	
Taylor	583	55	63	29.35	29.95	—.00	85.0		100	27	96	72	6	74	25				0.00		0	6,403	s.	27	s.	9	28	3	0	2.1	
Ohio Val. and Tenn.							**74.9**	**0.0**											**2.10**	**—1.4**										**4.7**	
Chattanooga	762	106	112	29.19	29.99	—.01	79.6	+3.7	101	14	90	63	8	69	33	68	63	65	1.31	—2.5	17	4,311	ne.	42	sw.	21	6	21	4	5.3	
Knoxville	1,004	10	88	28.95	29.98	—.03	76.8	+2.0	96	14	88	59	25	66	30	68	63	76	2.39	—1.7	16	4,037	sw.	48	nw.	15	8	15	8	5.3	
Memphis	397	140	154	29.55	29.96	—.02	79.9	+1.2	95	18	88	64	25	72	21	75	74	85	4.51	+0.9	7	5,675	sw.	39	nw.	22	14	10	7	4.5	
Nashville	546	122	131	29.42	29.95	—.01	78.6	+1.1	98	14	89	60	25	68	34	68	64	68	2.69	—0.7	9	4,009	w.	35	nw.	10	15	12	4	3.9	
Lexington	989	75	102	28.95	30.00	—.00	73.8	—0.1	93	3	84	55	17	64	27				1.89	—1.6	7	5,600	ne.	52	w.	21	13	16	2	4.0	
Louisville	525	114	136	29.42	30.00	—.00	75.8	—0.5	99	3	86	57	12	66	28	66	62	70	2.74	—0.8	7	4,776	n.	48	w.	15	15	11	5	3.9	
Evansville	431	72	82	29.51	29.97	—.02	76.4		97	3	86	58	12	67	29				1.82		6	4,430	ne.	27	n.	20	10	14	7	4.6	
Indianapolis	822	154	164	29.12	30.00	—.00	71.6	—2.0	91	3	81	51	23	62	26	64	61	71	2.09	—1.2	9	5,629	n.	44	w.	10	10	18	3	4.9	
Cincinnati	628	152	157	29.32	29.99	—.02	74.3	—0.7	95	3	84	55	23	65	26	64	59	64	0.65	—3.1	6	4,626	ne.	28	w.	3	15	12	4	4.3	
Columbus	824	87	100	29.12	30.00	—.01	70.6	—1.7	92	30	81	49	17	60	28	62	58	71	1.62	—1.6	7	6,503	ne.	32	nw.	6	16	10	6	6.2	
Pittsburg	842	116	123	29.10	29.98	—.03	71.0	—1.8	90	3	80	51	17	62	26	63	59	70	1.61	—1.6	9	3,248	n.	26	nw.	2	14	12	5	4.2	
Parkersburg	638	77	84	29.33	30.01	—.00	72.0	—1.6	92	30	83	50	23	61	30	65	63	75	1.58	—1.8	6	3,069	n.	27	nw.	1	11	15	5	4.9	
Elkins	1,940	41	50	27.99	30.00		67.0		87	2	79	42	18	54	38	60	59	88	3.61		12	2,086	n.	24	w.	3	6	22	3	5.4	
Lower Lake Region.							**67.5**	**—2.3**										**74**	**1.38**	**—1.6**										**4.8**	
Buffalo	767	178	206	29.15	29.97	—.02	66.6	—1.5	82	31	74	53	12	60	19	61	57	72	1.72	—1.4	13	8,250	w.	39	nw.	3	1	20	10	6.5	
Oswego	335	76	91	29.59	29.95	—.04	65.4	—2.8	86	31	72	50	13	59	21	61	58	76	2.23	—0.4	9	5,863	s.	24	w.	21	9	17	5	5.0	
Rochester	523	81	90	29.41	29.97	—.02	66.2	—2.2	89	31	75	49	13	58	28	60	57	75	1.90	—1.2	10	5,030	w.	23	w.	11	8	14	9	5.3	
Erie	713	92	102	29.23	29.98	—.03	66.7	—2.8	88	31	73	51	13	60	21	61	58	73	0.51	—2.8	6	5,863	nw.	30	sw.	7	15	5	11	4.9	
Cleveland	762	190	201	29.18	30.00	—.02	67.6	—2.0	88	31	75	50	17	62	30	62	59	76	1.60	—1.5	10	8,233	n.	39	w.	11	14	6	5	4.9	
Sandusky	629	62	70	29.32	30.00	—.00	69.0	—2.0	89	31	76	52	17	62	27				1.23	—1.9	10	4,824	ne.	23	nw.	11	20	8	3	3.1	
Toledo	628	123	127	29.33	30.00	—.00	66.6	—2.2	89	3	78	51	12	60	25	61	58	77	1.29	—1.4	6	5,454	ne.	28	sw.	31	15	13	3	4.4	
Detroit	730	153	193	29.21	30.00	—.01	68.0	—1.7	86	3	76	51	8	59	25	61	58	72	0.60	—2.1	4	6,376	ne.	29	nw.	11	15	11	5	4.2	
Upper Lake Region.							**64.0**	**—1.7**										**75**	**1.97**	**—1.1**										**4.8**	
Alpena	609	63	80	29.34	30.02	+.02	61.4	—2.1	84	31	71	42	12	52	30	57	54	77	2.53	—0.9	10	6,417	nw.	29	w.	31	13	10	8	4.7	
Escanaba	612	43	57	29.34	30.00	+.01	62.5	—2.1	81	2	71	45	12	54	24	57	54	75	1.37	—2.4	6	6,139	n.	31	sw.	31	13	14	4	4.5	
Grand Haven	632	54	92	29.28	29.99	—.00	64.4	—2.6	80	1	73	46	23	56	32	60	58	80	0.53	—2.1	4	6,324	nw.	34	sw.	31	11	15	5	4.5	
Houghton	668	66	74	29.26	29.98	+.01	62.3		83	29	72	44	12	53	34				1.82		9	4,632	w.	35	w.	31	12	14	5	4.9	
Marquette	734	79	116	29.20	30.00	+.01	62.6	—1.0	87	2	70	45	9	55	30	56	51	68	2.17	—0.7	8	7,168	nw.	53	w.	31	10	12	9	5.6	
Port Huron	638	70	120	29.33	30.02	+.02	64.6	—2.4	84	31	74	48	12	56	28	60	57	76	4.05	+1.5	6	6,414	ne.	25	w.	31	18	9	4	3.6	
Sault Ste. Marie	614	40	61	29.31	29.96	—.01	61.6	+0.8	81	2	70	43	12	54	27	56	52	74	1.54	—1.2	8	5,226	nw.	47	nw.	31	15	8	8	4.7	
Chicago	823	241	274	29.13	30.04	—.00	68.4	—2.5	86	2	78	55	14	64	24	63	60	74	1.44	—1.5	7	9,839	ne.	47	s.	20	15	10	6	4.0	
Milwaukee	681	124	142	29.29	30.02	+.02	67.1	—1.2	86	2	75	53	12	60	25	61	58	77	0.53	—2.2	3	6,775	ne.	30	se.	13	12	8	11	4.9	
Green Bay	617	49	57	29.34	30.00	+.01	65.5	—1.2	85	2	75	47	12	56	29	58	55	76	1.23	—1.4	9	6,103	ne.	38	sw.	31	5	18	8	6.0	
Duluth	792	95	116	29.22	29.98	+.01	62.2	—2.5	83	25	68	46	11	56	24	56	52	72	3.30	0.0	11	5,710	ne.	39	n.	1	7	16	8	5.5	
North Dakota.							**65.5**	**—0.9**										**71**	**2.17**	**+0.3**										**4.4**	
Moorhead	935	54	60	28.97	29.97	+.01	64.8	—0.4	85	27	76	39	11	54	36	59	55	77	3.42	+0.7	12	6,234	se.	35	se.	1	10	8	13	6.0	
Bismarck	1,674	16	29	28.20	29.94	—.00	66.3	—1.2	92	6	78	41	11	54	44	59	54	69	1.84	—0.1	7	7,034	s.	36	nw.	10	17	12	2	3.8	
Williston	1,875	15	31	27.97	29.92	—.01	65.5	—1.0	94	24	79	39	29	52	39	57	52	66	1.26	+0.1	9	6,749	n.	46	w.	17	23	7	1	3.5	

TABLE I.—*Climatological data for Weather Bureau Stations, August, 1902*—Continued.

Stations.	Barometer above sea level, feet.	Thermometer above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Miles per hour.	Direction.	Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
Upper Miss. Valley.							**71.0**	**− 1.8**										**76**	**5.00**	**+ 2.0**										**5.5**	
Minneapolis		99	208				66.5	− 2.6	86	2	75	48	11	58	25				5.94	+ 2.8	12	7,517	s.	42	s.	2	3	17	11	5.5	
St. Paul	837	114	124	29.08	29.98	+ .01	66.6	− 2.5	85	2	75	50	11	58	24	60	56	74	5.64	+ 2.3	12	4,635	se.	24	nw.	7	6	18	7	5.3	
La Crosse	714	71	87	29.24	29.99	+ .01	67.8	− 2.3	89	2	77	47	12	59	28				2.30	− 1.0	8	4,206	s.	29	nw.	7	15	13	3	3.8	
Davenport	606	71	79	29.32	29.96	− .02	70.4	− 2.4	90	2	79	51	11	62	24	64	61	77	7.25	+ 3.7	12	4,434	e.	21	se.	19	12	8	11	5.3	
Des Moines	861	84	88	29.08	29.99	+ .02	70.4	− 1.6	94	2	79	50	11	62	26	64	61	77	7.82	+ 4.6	13	5,331	se.	44	nw.	19	5	14	12	6.2	
Dubuque	698	100	117	29.25	29.99	+ .01	68.5	− 3.1	89	2	77	50	12	60	28	62	59	74	1.57	− 1.6	9	3,512	se.	35	se.	19	4	15	12	6.6	
Keokuk	614	63	78	29.31	29.96	− .02	72.2	− 2.3	96	2	81	52	11	63	27	65	63	78	6.93	+ 4.1	10	4,496	e.	26	w.	9	11	16	4	5.0	
Cairo	356	87	93	29.60	29.97	− .01	77.4	+ 0.4	98	3	86	60	12	69	25	71	68	80	3.26	+ 0.4	11	4,656	n.	46	n.	15	7	17	7	5.3	
Springfield, Ill.	644	82	93	29.31	29.96	− .02	72.1	− 1.3	91	2	81	53	11	63	27	65	63	79	5.12	+ 2.8	11	5,418	e.	38	w.	17	9	12	10	5.5	
Hannibal	534	75	110	29.40	29.96	− .02	73.0	− 1.2	93	13	82	52	12	64	31				4.02	+ 1.8	9	5,352	e.	37	sw.	5	5	13	13	6.3	
St. Louis	567	111	210	29.37	29.97	− .02	76.4	− 0.4	97	13	84	58	23	68	30	68	64	69	5.20	+ 1.7	10	5,630	s.	36	se.	18	7	12	12	5.7	
Missouri Valley.							**72.2**	**− 0.8**										**75**	**4.07**	**+ 1.1**										**5.4**	
Columbia	784	11	84	29.14	29.95	− .02	73.6	− 2.4	93	4	83	52	11	64	32				6.64	+ 4.1	11	4,929	nw.	39	nw.	18	9	14	8	5.7	
Kansas City	963	78	95	28.96	29.96	− .01	76.2	+ 0.5	96	13	85	58	11	67	27	68	65	74	3.77	− 0.1	13	5,446	se.	55	nw.	10	12	9	10	5.0	
Springfield, Mo	1,324	98	104	28.59	29.97	.00	75.6	− 1.6	93	18	85	57	12	67	28	70	68	80	4.80	+ 1.2	9	6,528	se.	41	nw.	10	19	8	4	3.3	
Topeka		81	89				76.2	+ 1.4	100	4	86	52	11	66	29				6.01	+ 2.1	11	5,897	s.	42	w.	20	8	17	6	4.9	
Lincoln	1,189	75	84	28.68	29.91	− .04	72.4	− 1.2	96	17	81	48	11	64	28	66	64	79	4.35	+ 1.1	16	6,385	se.	36	ne.	20	6	19	6	6.0	
Omaha	1,105	115	121	28.78	29.94	− .01	72.4	− 1.3	94	2	80	51	11	65	23	66	63	76	2.86	− 0.5	11	5,221	se.	30	n.	10	5	15	11	6.4	
Valentine	2,598	47	54	27.25	29.93	− .01	69.2	− 1.1	96	1	81	41	11	58	39	61	57	72	2.93	+ 0.9	19	8,307	e.	48	se.	17	12	13	6	4.9	
Sioux City	1,135	96	164	28.77	29.96	− .01	69.8	− 1.8	95	2	79	46	11	61	30				2.19	− 1.0	17	7,890	ne.	38	nw.	9	4	15	12	6.7	
Pierre	1,572	43	50	28.29	29.93	− .01	70.6	− 2.2	93	17	81	44	11	60	40	62	57	68	4.82	+ 3.2	16	6,202	se.	40	n.	9	10	11	10	5.5	
Huron	1,306	56	67	28.59	29.96	− .01	67.8	− 0.6	94	1	79	37	11	56	41	61	58	77	2.36	− 0.2	14	7,915	se.	58	s.	1	6	19	6	5.8	
Yankton	1,233	42	49	28.64	29.94	− .01	70.2	− 1.6	92	4	80	43	11	60	39				4.84	+ 1.7	14	4,761	se.	36	se.	9	10	15	6	4.9	
Northern Slope.							**68.1**	**+ 0.3**										**58**	**0.77**	**− 0.5**										**4.0**	
Havre	2,505	46	53	27.33	29.91	+ .02	66.0	+ 0.4	92	23	81	38	29	52	45	55	48	60	0.66	− 0.7	6	6,735	sw.	39	w.	17	17	14	0	3.0	
Miles City	2,371	42	50	27.44	29.86	− .07	71.4	− 0.3	96	24	85	48	11	58	42	64	61	73	1.34	+ 0.3	7	4,278	s.	34	w.	22	18	10	3	3.4	
Helena	4,110	88	94	25.83	29.95	− .01	64.9	− 1.6	89	6	77	42	31	50	38	50	39	43	0.32	− 0.3	3	5,694	sw.	40	w.	17	10	16	5	4.6	
Kalispell	2,965	45	51	26.93	29.95	− .01	61.5		88	8	76	35	29	47	41	50	42	58	0.95		8	4,405	w.	28	nw.	8	23	6	2	2.5	
Rapid City	3,234	46	50	26.60	29.89	− .04	69.1	− 0.8	92	17	81	45	11	58	41	58	52	58	0.72	− 0.6	8	5,644	se.	36	nw.	9	18	13	0	3.5	
Cheyenne	6,088	56	64	24.10	29.93	− .01	67.0	+ 2.0	94	1	80	47	11	54	38	52	43	51	0.53	− 1.0	8	6,782	nw.	40	nw.	8	9	15	7	5.4	
Lander	5,372	26	36	24.69	29.93	− .01	65.6	+ 0.7	94	1	83	36	31	48	43	51	41	50	0.06	− 0.6	1	2,646	sw.	30	nw.	27	12	19	0	3.8	
North Platte	2,821	43	52	27.08	29.95	+ .01	72.8	− 1.4	101	1	84	50	31	62	34	64	60	73	1.74	− 0.7	8	6,228	se.	36	ne.	8	7	19	5	5.5	
Middle Slope.							**77.0**	**+ 3.0**										**61**	**3.09**	**+ 0.6**										**4.0**	
Denver	5,291	79	151	24.78	29.93	+ .01	72.4	+ 2.3	100	1	87	52	27	58	39	56	46	51	0.76	− 0.7	8	5,676	s.	52	n.	9	8	16	7	5.5	
Pueblo	4,685	80	86	25.31	29.88	− .03	74.1	+ 1.8	104	2	88	54	11	60	42	58	49	51	2.67	+ 0.6	9	4,821	se.	44	n.	10	16	13	2	4.0	
Concordia	1,398	42	47	28.48	29.92	− .03	76.6	+ 2.2	104	2	87	47	11	66	33	68	64	73	5.22	+ 2.6	16	5,145	s.	30	n.	30	12	11	8	5.2	
Dodge	2,509	44	52	27.35	29.89	− .01	79.6	+ 4.4	105	20	94	52	11	66	36	66	60	63	1.62	− 1.2	11	8,458	se.	36	se.	21	18	11	2	3.5	
Wichita	1,358	78	85	28.53	29.93	− .02	79.5	+ 3.0	102	16	91	53	11	66	34	68	64	67	5.28	+ 2.3	9	6,160	s.	36	n.	10	17	10	4	3.3	
Oklahoma	1,214	79	86	28.65	29.90	− .04	83.2	+ 4.2	101	30	95	58	11	71	30	70	64	61	2.99	+ 0.3	5	7,971	s.	36	nw.	31	21	9	1	2.4	
Southern Slope.							**81.0**	**+ 4.5**										**55**	**1.24**	**− 1.2**										**2.8**	
Abilene	1,738	45	54	28.13	29.88	− .04	85.2	+ 5.0	101	29	96	66	11	75	25	70	63	53	0.06	− 2.6	1	5,693	se.	26	n.	10	22	9	0	2.3	
Amarillo	3,676	43	52	26.26	29.89	− .03	76.9	+ 4.0	97	19	90	52	11	64	32	63	56	57	2.42	+ 0.1	5	8,960	se.	38	e.	6	18	12	1	3.4	
Southern Plateau.							**77.4**	**− 0.7**										**41**	**2.02**	**+ 0.8**										**3.3**	
El Paso	3,762	10	110	26.16	29.83	− .01	79.5	+ 0.5	99	4	91	62	13	68	30	64	58	56	2.85	+ 1.0	8	6,071	e.	56	sw.	12	16	13	2	3.6	
Santa Fe	7,013	47	50	23.37	29.87	− .02	68.4	+ 2.1	91	4	79	51	7	57	29	53	44	50	2.47	− 0.1	14	4,139	se.	25	se.	16	18	8	5	3.5	
Flagstaff	6,907	12	25	23.45	29.88	− .04	63.2	− 3.2	93	2	76	41	31	50	39	51			6.10	+ 4.6	17		sw.				8	6	17	5.6	
Phoenix	1,108	50	56	28.67	29.78	− .01	89.6	+ 1.4	113	1	102	69	15	77	35	67	54	36	0.56	− 0.3	6	3,373	se.	36	se.	5	15	13	3	3.6	
Yuma	141	16	50	29.61	29.75	− .01	88.5	− 2.2	111	1	103	62	31	74	44	68	56	40	T.	− 0.4	0	4,578	sw.	24	s.	2	28	3	0	0.7	
Independence	3,910	51	58	25.95	29.86	+ .05	74.9	− 2.7	100	2	88	57	11	62	31	53	30	23	0.13	− 0.1	4	5,518	nw.	38	e.	6	21	7	3	2.9	
Middle Plateau.							**71.0**	**− 0.8**										**37**	**0.28**	**− 0.3**										**3.3**	
Carson City	4,720	82	92	25.30	29.90	+ .06	65.8	− 1.0	96	6	82	42	31	50	42	51	41	48	0.18	0.0	4	3,886	w.	27	sw.	13	15	12	4	3.3	
Winnemucca	4,344	59	70	25.60	29.91	+ .03	68.0	− 2.6	97	6	85	38	31	53	44	52	40	40	0.02	− 0.1	1	5,847	ne.	40	sw.	12	20	8	3	2.5	
Modena	5,479	10	38	24.65	29.88	+ .02	68.6		97	2	84	41	31	53	43	49	31	33	1.58		5	8,625	sw.	36	sw.	7	19	9	3	3.2	
Salt Lake City	4,366	105	110	25.60	29.88	− .03	74.6		103	9	86	52	31	63	30	53	35	27	0.15	− 0.6	2	4,856	se.	36	n.	16	19	9	3	3.1	
Grand Junction	4,608	43	51	25.38	29.89	− .01	75.6	+ 0.5	105	2	90	52	18	61	40	54	39	35	0.77	− 0.4	5	4,027	e.	32	sw.	29	12	12	7	4.5	
Northern Plateau.							**69.3**	**− 1.7**										**44**	**0.33**	**0.0**										**2.7**	
Baker City	3,471	53	58	26.46	29.99	+ .04	64.5	− 1.6	90	8	79	35	29	50	38	50	37	44	0.48	+ 0.3	4	4,084	nw.	23	nw.	27	20	5	6	3.3	
Boise	2,739	61	68	27.13	29.94	+ .01	70.2	− 2.0	97	7	86	43	18	58	33	53	40	40	0.20	0.0	1	2,823	w.	19	nw.	16	21	8	2	2.5	
Lewiston	757	52	61	29.15	29.94	− .01	73.4	− 1.2	102	6	88	46	29	58	41				0.69	+ 0.1	3	2,722	e.	33	nw.	27	25	3	2	2.1	
Pocatello	4,482	46	54	25.48	29.91	− .01	68.6	− 1.0	95	2	85	40	31	54	31	51	36	34	0.17	− 0.2	3	5,842	se.	34	w.	16	20	10	1	2.4	
Spokane	1,943	101	110	27.96	29.98	+ .03	66.6	− 2.4	94	7	81	40	30	52	42	52	40	46	0.38	+ 0.1	4	4,056	sw.	30	w.	27	18	8	5	3.7	
Walla Walla	1,000	65	73	28.91	29.97	+ .01	72.3	− 1.9	99	7	86	47	29	59	35	61	54	56	0.08	− 0.1	2	3,765	s.	24	w.	27	25	6	0	2.0	
N. Pac. Coast Reg.							**61.0**	**+ 0.2**										**73**	**0.46**	**− 0.4**										**3.6**	
Neah Bay	50	7	50	30.02	30.06	− .06	58.0	− 0.9	82	9	65	46	*	51	33	54	52	85	1.10	− 1.2	6	6,572	w.	28	w.	20	16	8	7	3.8	
North Head	211	11	56	29.87	30.09	− .06	58.2	− 0.9	74	10	62	49	5	54	23	55	54	87	0.43	− 0.6	3	11,070	nw.	37	se.	15	11	8	12	5.6	
Port Crescent	259	13	20	29.82	30.05	− .03	56.8	+ 0.1	90	6	67	38	29	47	42				0.57	− 0.2	4	3,493	w.	22	w.	30	19	7	5	3.1	
Seattle	123	114	151	29.95	30.08	− .08	64.4	+ 1.2	90	10	74	49	30	55	31	57	51	67	0.48	− 0.1	4	4,360	n.	22	n.	9	20	6	5	3.0	
Tacoma	213	113	120	29.84	30.07	− .05	62.9	+ 1.3	88	10	73	46	25	52	32				0.20	− 0.5	3	3,617	n.	18	n.	28	18	10	3	3.7	
Astoria	20	57	64				61.6	− 0.6	86	6	71	46	28	53	30				0.45	− 0.6	5		n.				18	10	3	3.3	
Portland, Oreg	154	68	96	29.88	30.03	+ .02	66.8	+ 0.9	99	7	79	44	28	55	33	58	52	64	0.44	− 0.1	2	4,000	nw.	19	nw.	5	22	5	4	3.0	
Roseburg	518	56	67	29.45	30.00	.00	66.8	+ 0.6	99	6	82	44	17	52	41	56	48	60	T.	− 0.2	0	2,952	n.	20	n.	4	17	10	4	3.1	
Mid. Pac. Coast Reg.							**65.0**	**+ 0.3**										**67**	**T.**	**− 0.1**										**3.6**	
Eureka	62	62	80	29.95	30.01	+ .01	57.0	+ 0.5	65	15	61	49	29	53	13	54	51	84	T.	− 0.1	0	3,874	nw.	29	n.	17	9	8	14	5.8	
Mount Tamalpais	2,375	11	18	27.52	29.96	+ .03	65.8		91	5	73	47	25	58	24	54	46	55	T.		0	8,320	nw.	63	nw.	16	19	11	1	2.5	
Red Bluff	332	50	56	29.53	29.88	− .02	78.6	− 2.5	111	5	93	58	21	64	41	64	55	50	T.	0.0	0	3,032	se.	24	se.	10	26	5	0	1.6	
Sacramento	69	106	117	29.80	29.88	+ .03	71.4	− 1.3	101	3	85	52	26	57	39	60	54	61	T.	0.0	0	6,340	s.	22	sw.	19	25	4	2	1.6	
San Francisco	155	161	167	29.81	29.98	+ .06	60.6	+ 1.9	82	31	66	52	5	55	28	56	54	84	T.	0.0	0	9,104	w.	34	w.	1	19	9	3	3.4	
Point Reyes Light	490	7	30	29.42	29.94		57.6	+ 2.7	70	31	62	50	5	53	17				T.	− 0.2	0	12,508	nw.	56	nw.	16	9	4	18	6.7	
S. Pac. Coast Reg.							**69.5**	**− 2.0**										**69**	**T.**	**0.0**										**3.1**	
Fresno	330	67	70	29.50	29.84	+ .02	78.4	− 3.3	110	6	95	55	27	61	40	60	45	41	T.	0.0	0	4,164	nw.	17	nw.	16	27	3	1	1.2	
Los Angeles	338	74	82	29.57	29.93	+ .05	#69.1	− 1.3	94	1	79	52	29	59	34	61	58	78	T.	0.0	0	3,416	w.	15	w.	27	12	19	0	3.8	
San Diego	87	94	102	29.83	29.92	+ .01	66.8	− 2.1	79	1	70	60	25	63	16	62	60	80	T.	− 0.1	0	4,312	nw.	22	w.	14	20	7	4	3.5	
San Luis Obispo	201	46	48	29.77	29.98	+ .04	63.7	− 1.1	88	1	74	47	13	53	36	57	53	76	T.	0.0	0	3,483	w.	16	w.	16	20	5	6	3.9	
West Indies.																																
Basseterre	29	41	54	29.95	29.98	+ .02	81.3		87	27	86	71	9	76	15	75	73	75	4.29		16	7,356	e.	32	se.	9	9	19	3	4.9	
Bridgetown	30	57	65	29.91	29.94	+ .01	80.8	+ 1.8	88	30	86	70	29	75	17	76	74	78	8.19	+ 1.8	23	6,065	e.	35	e.	20	11	8	12	5.8	
Cienfuegos	52	62	67	29.90	29.96	− .01	80.8		93	3	89	70	6	73	20	74	72	84	10.13		22	4,226	ne.	30	se.	12	6	23	2	5.0	
Grand Turk	11	6	20	29.99	30.00	− .02	84.0		94	22	91	70	10	77	20				1.80		11		se.				10	15	6	5.0	
Havana	57	87	105	29.91	29.97	− .01	81.0	− 1.2	91	10	88	67	1	74	21	75	74	81	3.21	− 2.8	10	5,716	e.	32	ne.	12	14	17	0	4.1	
Kingston	286	38	52	29.63	29.93	− .02	79.8		93	8	89	70	24	71	23	73	70	76	3.45		10	4,632	ne.	27	se.	5	5	22	4	5.0	
Port of Spain	40	65	66	29.89	29.93	+ .04	79.4		90	*	86	69	2	74	12				T.		22		e.				9	16	6	5.0	
Puerto Principe	352	55	62	29.63	29.99	− .04	81.0		95	2	91	67	22	71	28	74	73	85	12.65		17	4,125	ne.	44	sw.	2	9	16	6	5.0	
Roseau	25	36	45	29.92	29.95	+ .01	81.7		91	28	88	72	8	74	18				6.29		22		ne.								
San Juan	82	48	90	29.90	29.98	+ .01	80.9		91	27	87	71	31	75	15	76	74	79	4.60	− 1.2	15	8,532	e.	38	ne.	9	7	20	4	5.5	
Santiago de Cuba	82	46	52	29.87	29.95	.00	80.9		93	16	90	69	25	72	22	74	72	78	0.76		8	4,380	n.	27	ne.	22	5	22	4	5.5	
Santo Domingo	57	37	44	29.92	29.98	+ .03	79.0		91	9	86	70	13	72	18	75	73	84	3.56		14	4,076	n.	20	se.	14	6	18	7	5.6	

NOTE.—The data at stations having no departures are not used in computing the district averages.   *More than one date.

TABLE II.—*Climatological record of voluntary and other cooperating observers, August, 1902.*

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Alabama.					
Ashville	104	59	81.4	2.12	
Benton				3.49	
Bermuda	104ᵃ	66ᵃ	82.7ᶜ	11.09	
Bridgeport				4.84	
Burkeville				3.45	
Calera				3.08	
Camphill	100	63	84.6	4.40	
Citronelle	99	67	83.6	3.79	
Clanton	99	64	81.4	3.09	
Cordova	104	58	82.4	2.49	
Daphne	100ᵃ	67ᵃ	83.1ᶜ	2.25	
Decatur	104	62	82.4	1.28	
Demopolis				4.63	
Elba	102	62	82.6	3.01	
Eufaula a	103	65	82.8	4.38	
Eutaw	103	62	84.3	3.52	
Evergreen	98	68	82.4	6.30	
Flomaton	97	67	82.0	6.50	
Florence a				3.05	
Florence b	100	54	80.2	3.29	
Fort Deposit	101	68	82.6	2.46	
Gadsden	106	61	82.5	2.09	
Goodwater	103	64	81.6	3.10	
Greensboro	100	67	83.6	3.36	
Greenville				3.90	
Hamilton	101	52	78.6	5.44	
Helena				2.20	
Highland Home	100	69	82.1	3.06	
Letohatchie				0.59	
Livingston a	97	65	82.6	0.78	
Lock No. 4	105	63	84.4	2.22	
Madison Station	103	61	81.2	2.04	
Maplegrove	106	58	80.9	1.79	
Marion	102	67	83.4	3.87	
Newbern	107	62	84.8	5.60	
Notasulga				2.65	
Oneonta	99	59	79.3	2.55	
Opelika	99	66	80.5	7.26	
Oxanna	103	60	82.7	3.04	
Ozark	103	68	82.8	5.30	
Prattville	101	62	82.2	1.03	
Pushmataha	100	55	82.1	5.18	
Riverton	98	53	77.6	4.86	
Scottsboro	101	57	79.2	3.87	
Selma	104	67	84.2	3.39	
Talladega	106	60	83.0	3.44	
Tallassee				4.16	
Thomasville	101	66	84.0	4.88	
Tuscaloosa	105	64	84.8	2.72	
Tuscumbia	98	58	80.4	4.05	
Tuskegee	104	66	84.0	2.38	
Union Springs	101	68	83.3	1.90	
Uniontown	103ᵃ	67ᵃ	84.0ᵃ	4.60	
Valleyhead	102	60	80.2	2.17	
Verbena				4.29	
Wetumpka	102	67	84.6	3.28	
Alaska.					
Coal Harbor	67	42	52.5	3.05	
Copper Center	85	28	54.8	1.08	
Fort Egbert	78	31	54.5	1.28	
Fort Liscum	70	33	48.4	8.56	
Fort Yukon		40		0.74	
Juneau	62	41	52.4	12.10	
Killisnoo	68	41	54.0	4.80	
Sitka	64	40	54.2	14.96	
Skagway	68	32	54.2	3.03	
Teller	74	25	49.4	1.18	
Tyoonok	73	43	55.2	5.40	
Arizona.					
Allaire Ranch				2.92	
Arizona Canal Co's Dam	114	68	88.8	0.80	
Ashfork	100	35	65.9	1.00	
Aztec *1	118	80	96.0	0.15	
Benson *1	104	70	81.6	1.29	
Bisbee	91	51	73.4	5.48	
Buckeye	108	60	86.0	T.	
Casagrande *1	119	85	97.8	1.53	
Champie Camp	118	58	85.8	2.10	
Cochise *1	98	68	80.7	1.35	
Congress	106	62	83.7	2.44	
Dragoon Summit *1	96	62	75.8	2.65	
Dudleyville	110	64	82.3	2.49	
Duncan	104	55	77.3	2.48	
Fort Apache	100	40	71.2	2.72	
Fort Defiance	96	46	67.1	2.81	
Fort Grant	105	53	77.7	3.40	
Fort Huachuca	99	60	79.2	4.43	
Fort Mohave	117ᵃ	54ᵃ	88.8ᵃ	0.00	
Gilabend *1	112	75	94.0	0.00	
Globe	105	52	80.0	1.30	
Jerome	101	59	78.0	3.90	
Kingman	106ᵈ	50ᵈ	80.0ᵈ	1.10	
Maricopa *1	114	78	92.3	0.00	
Mesa	113	66	87.4	0.59	
Mesa (near)	114	64	87.8	1.03	
Mohawk Summit *1	115	82	94.9	0.00	
Mount Huachuca	98	59	75.0	3.45	
Natural Bridge				0.59	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Arizona—Cont'd.					
Nogales	102	59	76.4	5.61	
Oracle	99	60	78.4	2.06	
Oro				1.86	
Phoenix	114	63	88.6	0.63	
Pima	107	58	82.8	1.34	
Pinal Ranch				1.04	
Prescott	97	40	68.1	4.64	
St. Johns	104	45	73.0	2.45	
Sentinel *1	114	85	94.8	0.50	
Showlow				1.96	
Signal	118	56	87.4	1.55	
Superstition				1.04	
Taylor	100	47	77.4	2.42	
Tombstone	100	58	75.7	4.07	
Tonto	112	62	82.9	1.50	
Tuba	108	52	76.1	0.67	
Tucson	109	65	84.1	1.31	
Vail *5	99	70	82.6	T.	
Walnut Grove				3.30	
Willcox *1	108	49	74.0	2.70	
Williams	101	40	67.5	2.42	
Yarnell				2.64	
Arkansas.					
Alco	100	56	79.4	2.85	
Amity	100	65	81.6	1.94	
Arkadelphia	108	60ᵃ	82.1ᵈ	1.76	
Arkansas City				3.50	
Batesville	104	61	81.8	1.31	
Beebranch	100ᵃ	61ᵃ	80.8ᵃ	1.95	
Blanchard Springs	97	66	82.3	1.16	
Brinkley	97	63	80.2	4.13	
Camden a				0.90	
Camden b	100	68	83.7	0.42	
Conway	107			0.84	
Corning	102	55	78.3	7.54	
Dallas	100	62	81.6	4.60	
Dardanelle				2.40	
De Queen	103	67	84.0	0.17	
Dutton	92	59	75.7	3.34ᵇ	
Eureka Springs	102	56	80.0	2.19	
Fayetteville	101ᵈ	53ᵈ	78.8ᵈ	5.19	
Forrest City	97	60	80.4	5.74	
Fulton				0.45	
Helena a				2.73	
Helena b	98	61	80.7	5.59	
Jonesboro	103ᵃ	59ᵃ	80.4ᵃ	3.24	
Lacrosse	101	60	79.2	5.19	
Lake Village	99	63	82.1	1.52	
Lonoke	100	61	80.2	0.90	
Lutherville	96	57	77.8	4.21	
Malvern	103	63	83.0	0.95	
Marianna	100	60	80.8	1.47	
Marvell	99	61	81.6	2.26	
Mossville	93	58	76.2	5.84	
Mountain Home	102	55	80.4	2.33	
Mount Nebo	89	62	78.0	2.00	
New Gascony	99	63	77.2	0.06	
Newport a				2.33	
Newport b	103	60	81.0	2.23	
Newport c	101	61	80.0	1.98	
Oregon	102	53	78.4	2.00	
Ozark	100	64	82.2	3.58	
Perry	97	60	80.3		
Pinebluff	103	65	83.0	1.20	
Pocahontas	102	56	79.4	5.09	
Pond	98	51	79.4	2.18	
Prescott	97	67	82.6	0.20	
Princeton	98	64	81.6	0.20	
Rison	105	62	83.3	0.00	
Rosadale	101	68	84.2	0.07	
Russellville	98	64	80.8	2.15	
Silversprings	100	55	79.0	1.62	
Spielerville	101	59	81.1	5.44	
Stuttgart	99	63	81.1	0.55	
Texarkana	99	70	84.0	0.67	
Warren	99	65	82.2	0.90	
Washington	95	68	81.2	0.08	
Wiggs	96	61	79.4	1.25	
Winchester	100	64	82.3	2.47	
Winslow	93	58	76.3	6.27	
Witts Springs	95ᵃ	56ᵃ	76.2ᵉ	6.71	
California.					
Angiola	108	48	76.4	0.00	
Azusa	101	50	73.2	0.00	
Bakersfield	107	54	77.6	T.	
Ballast Point L. H				0.00	
Berkeley	82	53	63.3	T.	
Bishop	101	43	69.5	0.12	
Boca *1	84	28	57.6	0.00	
Bodie	84	17	51.3	0.40	
Bowman	94	48	66.4	T.	
Branscomb				0.07	
Caliente *1	104	68	80.3	0.00	
Campbell	97	41	66.4	0.00	
Campo				0.00	
Cape Mendocino L. H				0.00	
Cedarville	97	37	66.5	0.23	
Chico	109	50	75.9	0.00	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
California—Cont'd.					
Chino *1	95	57	73.4	0.00	
Cisco *1	85	40	56.0	T.	
Claremont	100	41	68.2	0.00	
Cloverdale	104	45	70.4	0.01	
Colusa	100	53	74.5	T.	
Corning *1	105	60	77.0	0.00	
Coronado	84	60	68.0	0.00	
Crescent City	75	40	57.2	0.06	
Crescent City L. H				0.00	
Cuyamaca	84	37	62.2	0.00	
Delano *1	106	66	83.8	0.00	
Delta *1	106	57	75.4	0.28	
Drytown	104	48	72.2		
Dunnigan *1	100	60	78.6	T.	
Durham *5	97	56	74.2	0.00	
East Brother L. H				0.00	
Edmanton *1	95	44	63.6	0.02	
Elcajon	101	49	71.3	0.00	
Elmdale	109	46	74.8	0.00	
Elsinore	109	48	74.4	0.00	
Escondido	101	43	71.2	0.00	
Fallbrook	100	46	70.2	0.00	
Folsom *1	105	60	75.1	0.04	
Fordyce Dam				0.23	
Fort Bragg				T.	
Fort Ross	74	48	59.4	0.00	
Foster				0.00	
Georgetown	100	48	72.6	0.05	
Geyserville	96	60	76.8	0.00	
Goshen *5	107	60	80.0	T.	
Grass Valley				T.	
Greenville	102	32	64.2	0.16	
Hanford	111	41	71.9	0.00	
Healdsburg	102	42	67.0	T.	
Hollister	100	44	65.6	0.00	
Humboldt L. H				0.00	
Idylwild	91	40	64.1	0.00	
Imperial	114	62	90.2	0.00	
Indio *1	112	75	93.3	0.00	
Iowa Hill *1	92	58	70.8	0.15	
Irvine	92	60	72.4	0.00	
Jackson	95	51	72.2	T.	
Jolon				T.	
Kennedy Gold Mine	98	46	68.9	0.00	
Kent				0.00	
Kernville				0.00	
King City	102	42	68.6	0.00	
Kono Tayee	98	54	73.8	T.	
Laguna Valley				0.00	
Laporte *1	91	45	59.0	T.	
Las Fuentes Ranch				0.00	
Legrande	108	50	76.7	0.00	
Lemoncove	109	53	78.4	0.00	
Lick Observatory	89	39	66.9	0.00	
Lime Point L. H				0.00	
Livermore	106	45	70.6	0.13	
Lodi	103	46	70.6	T.	
Los Gatos	98	45	68.2	0.00	
Mammoth *5	114	71	92.6	0.00	
Manzana	108	51	74.8	0.00	
Mare Island L. H				0.00	
Mendota	108	58	80.4	0.00	
Merced	108	51	76.4	T.	
Mercury	100	50	68.6	0.03	
Mills College				T.	
Milo				0.00	
Milton (near)	103	53	74.2	T.	
Modesto *1	105	61	78.9	0.00	
Mohave *1	105	60	76.8	0.00	
Mokelumne Hill		50	68.2	T.	
Monterio	96	52	72.6	0.00	
Monterey *1	72	51	61.4	0.00	
Mount St. Helena				0.08	
Napa	103	48	69.6	0.02	
Needles	112	68	93.2	0.13	
Nevada	92	42	66.1	0.00	
New Castle	105	59	80.8	0.00	
Newhall *1	107	58	73.8	0.00	
Newman	111	52	76.6	0.00	
Niles	94	48	67.1	0.00	
North Bloomfield	101	46	70.5	0.04	
North Ontario	98	47	70.8	0.00	
North San Juan *1	97	47	72.7	0.02	
Oakland	81	54	65.0	T.	
Ogilby *1	118	85	93.8	0.00	
Orland *1	106	65	84.7	0.00	
Palermo	105	49	74.3	T.	
Paso Robles	105	38	65.5	0.00	
Peachland *5	91	53	65.9	0.09	
Piedras Blancas L. H				0.00	
Pigeon Point L. H				0.00	
Pilot Creek				0.17	
Pine Crest	92	51	66.0	0.00	
Placerville	95	44	67.3	0.14	
Point Ano Nuevo L. H				0.00	
Point Arena L. H				0.00	
Point Bonita L. H				0.00	
Point Conception L. H				0.00	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	Ins.	Ins.
Point Fermin L. H				0.00	
Point George L. H				0.02	
Point Hueneme L. H				0.00	
Point Lobos	69	53	59.4	0.00	
Point Loma L. H				0.00	
Point Montara L. H.				0.00	
Point Pinos L. H.				0.00	
Point Sur L. H				0.00	
Pomona (near)	105	47	73.8	0.00	
Porterville	109	50	77.5	0.00	
Poway	96	34	63.8	T.	
Quincy	107	56	79.0	0.03	
Redding	106	49	74.5	0.00	
Redlands	109	44	76.0	0.00	
Reedley	96	54	72.4	T.	
Represa				T.	
Riovista	101	54	71.9	T.	
Riverside	102	45	71.2	0.00	
Roe Island L. H.				0.00	
Rohnerville *5	77	38	61.1	T.	
Rosewood	111	51	76.7	0.15	
Sacramento	96	50	70.2	T.	
Salinas	90	45	64.2	0.00	
Salton *1	121	74	97.8	0.00	
San Bernardino	107	42	73.0	0.00	
San Jacinto	106	45	73.6	0.00	
San Jose	95	45	67.4	0.00	
San Leandro	90	47	64.8	0.00	
San Luis L. H.				0.00	
San Mateo *1	90	60	66.9	0.00	
San Miguel *1	102	49	69.5	0.00	
Santa Barbara	88	53	65.4	0.00	
Santa Barbara L. H				0.00	
Santa Clara				0.02	
Santa Cruz	92	41	62.8	0.00	
Santa Cruz L. H.				0.00	
Santa Maria	79	46	64.5	0.00	
Santa Monica	80	49	63.0	0.00	
Santa Paula	96	50	71.0	T.	
Santa Rosa	101	44	66.0	T.	
Shasta	112	53	80.4	0.01	
Sierra Madre	96	49	69.8	0.00	
Sonoma				0.04	
S. E. Farallone L. H.				0.00	
Stockton	100	52	71.0	0.00	
Storey	107	51	76.7	0.00	
Summerdale	89	44	64.8	0.00	
Susanville	95	41	65.8	0.09	
Tehama *1	108	62	82.1	0.00	
Tejon Ranch	98	57	77.8	0.00	
Trinidad L. H				0.00	
Truckee *1	92	40	57.2	1.10	
Tulare c	106	48	76.4	0.00	
Ukiah	105	49	68.6	0.00	
Upperlake	105	45	72.0	0.07	
Upper Mattole *1	88	50	61.4	0.00	
Vacaville *1	103	57	73.0	T.	
Visalia	107	49	76.9	0.00	
Volcano *1	121	82	99.4	0.00	
Wasco	105	55	80.6	0.00	
Wheatland	98	51	71.8	0.04	
Williams *1	103	60	80.4	T.	
Willits	104	42	69.0	0.62	
Willows	105	52	75.4	T.	
Wire Bridge *5	101	56	76.2	T.	
Yerba Buena L. H.				0.00	
Yreka	98	45	69.7	1.01	
Yuba City *5	97	60	78.9	0.08	
Zenia				0.08	
Colorado.					
Alford	98	41	67.4	0.78	
Arkins	100	50	71.2	0.18	
Ashcroft	87	31	55.8	2.34	
Blaine	111	52	79.8	0.44	
Boulder	96	49	71.8	0.53	
Boxelder				1.20	
Breckenridge	84	23	52.8	1.53	
Buenavista				0.15	
Canyon	102	50	73.5	1.63	
Castlerock	98	45	68.6	1.29	
Cedaredge	96	43	69.2	1.05	
Cheyenne Wells	104	45	73.6	6.06	
Clearview	86	37	59.0	3.18	
Collbran	100	42	69.4	1.87	
Colorado Springs	98	48	68.0	2.09	
Delta	103	41	72.6	1.39	
Durango	99	43	68.1	2.19	
Fort Collins	100	42	68.7	0.67	
Fort Morgan	100	47	72.0	2.41	
Fox	103	46	73.7	2.60	
Garnett	92	36	61.8	3.20	
Gilman				1.81	
Gleneyre	101	42	67.2	2.78	
Greeley	103	48	72.4	0.48	
Grover				2.35	
Gunnison	92	31	60.4	2.47	
Hamps	99	44	68.6	2.68	
Hoehne	103	50	72.6	2.64	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Colorado—Cont'd.	°	°	°	Ins.	Ins.
Holyoke (near)	104	50	72.8	0.95	
Husted	97	42	65.8	3.20	
Lake Moraine	78	24	54.7	4.05	
Lamar	105	54	79.2	3.01	
Laporte				0.63	
Las Animas	105	51	75.4	2.79	
Lay	98	28	63.5	0.12	
Leadville (near)				2.62	
Leroy	102	46	71.2	3.70	
Longs Peak	83	33	54.6	1.80	
Mancos	95	37	65.2	2.45	
Marshall Pass				0.96	
Meeker	96	37	63.7	0.32	
Mitchell				1.70	
Montrose				1.09	
Moraine	89	37	59.6	1.00	
Pagoda	93	31	62.3	T.	
Parachute	104	40	71.6	0.66	
Rangely	95	36	66.6	0.28	
Rockyford	104	50	75.5	2.72	
Rogers Mesa	103	44	71.4	0.82	
Ruby				0.19	
Russell	92	31	59.0	2.80	
Saguache	90	43	63.4	2.66	
Salida	100	37	65.6	0.90	
San Luis	91	36	61.8	1.19	
Santa Clara	94	42	65.0	1.63	
Sapinero				1.57	
Seibert				3.40	
Silt	101	44	72.9	1.23	
Sugarloaf	97	41	66.4	1.48	
Telluride	90	34	59.2	2.86	
Trinidad	98	47	70.1	2.30	
Twinlakes				0.99	
Vilas				0.70	
Wagon Wheel	89	25	56.2	2.78	
Wallet				4.57	
Westcliffe	92	39	61.0	2.96	
Whitepine	81	29	54.1	2.51	
Wray	100	47	73.2	2.71	
Yuma				3.33	
Connecticut.					
Bridgeport	89	49	69.6	2.39	
Canton	83	42	64.2	3.73	
Colchester	84	47	66.8	2.10	
Falls Village				3.24	
Hartford	84	50	68.2	4.80	
Hawleyville	85	44	65.9	3.14	
Lake Konomoc				1.59	
New London	85	52	68.0	1.63	
North Grosvenor Dale	88	43	67.2	3.59	
Norwalk	90	44	68.2	3.09	
Southington	83	46	66.2	3.25	
South Manchester				2.83	
Storrs	87	45	66.0	2.17	
Voluntown	90b	44¹	67.6¹	1.67	
Waterbury	89	44	69.0	2.82	
West Cornwall	84	44	65.1	4.70	
West Simsbury				3.50	
Delaware.					
Milford	96	48	74.2	1.22	
Millsboro	93	49	72.3	2.02	
Newark	88	48	72.0	1.54	
Seaford	93	52	73.8	1.69	
District of Columbia.					
Distributing Reservoir *5	89	59	74.3	1.85	
Receiving Reservoir *5	86	60	73.4	2.17	
West Washington	93	48	72.2	2.11	
Florida.					
Archer	97	62	80.7	7.07	
Avon Park	99	66	82.6	4.43	
Bartow	97	69	82.6	4.97	
Bombay	102	67	83.4	2.42	
Brooksville	98	66	82.0	7.47	
Carrabelle	96	71	83.0	3.79	
Clermont	99	68	83.3	6.47	
De Funiak Springs	99	67	82.0	7.35	
Deland	97	70	80.6		
Eustis	101	67	84.3	2.47	
Federal Point	98	62	81.1	5.19	
Fernandina	98	69	81.5	4.54	
Flamingo	95	73	82.4	7.10	
Fort Meade	100	64	81.9	6.51	
Fort Myers	93	69	81.3	3.97	
Fort Pierce	98	67	80.5	5.11	
Gainesville	99	64	81.9	2.77	
Huntington	100	61	81.6	3.06	
Hypoluxo	95	69	80.8	4.96	
Inverness	99	66	82.2	4.11	
Johnstown	99	59	80.3	6.49	
Kissimmee	98¹	68	82.8c	7.27	
Lake City	99	61	81.8	5.21	
Macclenny	103	57	82.4	4.79	
Malabar	100	69	82.4	1.80	
Manatee	95	68	81.7	4.69	
Marco	95	72	84.0	3.44	
Marianna	99	67	82.8	2.68	
Merritt Island	96	72	82.1	8.50	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Florida—Cont'd.	°	°	°	Ins.	Ins.
Miami	93	60	81.6	5.33	
Molino	103	65	82.6	9.13	
New Smyrna	96	67	80.7	2.39	
Nocatee	101	66	83.2	2.87	
Ocala	101	61	81.8	3.90	
Orlando	99	68	82.4	3.53	
Pinemount	100	61	82.2	5.17	
Quincy	99	60	82.6	0.92	
Rideout	102	58	81.4	4.33	
St. Andrews	96	66	83.0	3.72	
St. Augustine	98	71	81.4	3.89	
St. Leo	100	66	82.2	6.93	
Stephensville				5.97	
Sumner	96	57	80.4	4.90	
Switzerland	101	60	80.9	3.79	
Tallahassee	93	67	80.4	4.98	
Tarpon Springs	96	67	82.2	4.78	
Titusville	100c	66c	81.6c	7.01	
Waukeenah	100	65	82.4	4.25	
Wausau	105	66	84.0	3.27	
Wewahitchka	101z	64	83.0d	2.11	
Georgia.					
Adairsville	99c	62c	79.6c	4.09	
Albany	102	65	84.6	5.94	
Allapaha	98	61	81.4	4.08	
Allentown	99	62	80.2	3.80	
Alpharetta	98	61	78.4	2.28	
Americus	99	67	81.5	6.12	
Athens	95	64	78.8	3.56	
Bainbridge	98	66	81.8	3.38	
Blakely	98	67	80.6	4.15	
Bowersville	99	59	78.5	5.72	
Brent	106	60	80.9	3.26	
Butler				5.82	
Camak	101	70	80.2	0.90	
Canton				2.57	
Carlton				4.05	
Clayton	95	55	74.0	2.41	
Columbus	98	70	83.4	4.28	
Covington	103	62	80.0	5.55	
Dahlonega	95	60	76.2	3.34	
Diamond	95	56	74.5	5.3?	
Douglas	104	61	83.0	1.44	
Dublin				5.05	
Eastman	101	65	82.5	3.63	
Elberton	100	62	79.4	3.22	
Experiment	100	63	79.6	4.99	
Fitzgerald	104	63	84.0	1.41	
Fleming	104	58	80.4	3.42	
Fort Gaines	104	68		5.27	
Gainesville	99	62	78.1	3.02	
Gillsville	100	59	78.6	2.58	
Greensboro	97	61	78.2	6.07	
Griffin	103	64	82.2	4.14	
Harrison	99	63	80.0	11.11	
Hawkinsville	102	63	82.0	2.18	
Hephzibah					
Lost Mountain	98	64	79.5	4.48	
Louisville	99	63	80.2	4.44	
Lumpkin	102	64	81.8	4.38	
Marshallville				2.17	
Mauzy	102	62	82.5	2.67	
Milledgeville	100	62	79.7	4.05	
Millen	101	70		2.25	
Monticello	104	62	81.4	3.42	
Morgan	100	61	80.4	2.07	
Naylor	102	60	81.9	3.18	
Newnan	102	65	81.0	3.64	
Oakdale				1.33	
Pelham				2.75	
Point Peter	101	59	78.5	3.89	
Poulan	101	62	81.0	3.19	
Putnam	103	63	82.0	4.00	
Quitman	97	62		5.58	
Ramsey	97	56	77.3	5.82	
Resaca				0.97	
Rome	102	60	80.4	6.80	
St. Marys	105	64	82.2	3.89	
Statesboro	102	61	81.4	3.15	
Stillmore	100	63	80.1	4.00	
Talbotton	103	63	80.6	3.33	
Tallapoosa	102	58	80.6	2.13	
Thomasville	98	66	82.6	2.29	
Toccoa	97	60	77.5	5.83	
Valona	100	61	80.8	4.50	
Vidalia	100	63	82.2	6.07	
Washington	97	64	79.7	3.72	
Waverly	102	62	82.0	8.57	
Waycross	97	63	81.6	2.45	
Waynesboro	96	63	78.8	3.37	
Westpoint	100	66	82.6	4.23	
Woodbury	102	58	80.5	4.13	
Idaho.					
Albion	93	34	66.2	0.25	
American Falls	98	33	68.2	0.18	
Blackfoot	98	42	73.6	0.00	
Burnside	101	35	66.8	0.45	
Chesterfield	93	24	58.6	0.20	

TABLE II.—*Climatological record of voluntary and other cooperating observers—Continued.*

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Idaho—Cont'd.	°	°	°	*Ins.*	*Ins.*
Downey	96	30	63.0	T.	
Forney	97	21	59.4	0.68	
Garnet	105	40	76.2	T.	
Hailey	99	31	65.8	0.04	
Idaho City	89	30	60.6	T.	
Lakeview	93	38	62.7	0.75	
Lost River	94	31	65.8	0.21	
Moscow	96	36	66.6	0.27	
Murray	88	33	59.8	1.09	
Oakley	100	34	68.0		
Ola	98	37	68.5	0.75	
Payette	103	40	75.4	0.47	
Pollock	100	40	67.9	1.32	
Porthill	93	33	65.0	1.06	
Priest River	90	31	60.2	0.75	
St. Maries	94	34	63.4	0.98	
Silver City	93	31	63.6	0.86	
Soldier	94	24	63.2	0.04	
Swan Valley				0.10	
Vernon	95e	27e	64.0e	T.	
Weston	97e	33	66.6	0.51	
Illinois.					
Albion	96	54	75.0	3.02	
Aledo	92	49	69.9	6.89	
Alexander	94	50	71.8	5.38	
Antioch	89	41	66.4	0.55	
Ashton	87	46	67.1	2.51	
Astoria	88	49	70.0	5.58	
Aurora	87	45	68.0	2.32	
Benton	100	52	77.6	3.30	
Bloomington	93	47	71.0	5.81	
Cambridge	90	51	70.2	4.64	
Carlinville	96	51	73.0	5.43	
Carrollton	95	53	73.2	6.07	
Centralia	99	50	75.0	5.27	
Charleston	95	50	72.0	4.24	
Chemung	85	41	65.8	1.06	
Chester				4.77	
Cisne	98	51	75.2	3.29	
Coatsburg	93	50	71.8	4.53	
Cobden	101	55	77.4	4.45	
Danville	90	53	72.4	1.59	
Decatur	93	47	71.1	7.01	
Dixon	89	50	68.8	2.62	
Dwight	90	45	70.1	3.62	
Effingham	96	52e	74.1	4.98	
Equality	102	50	77.1	8.39	
Flora	96	52	74.1	3.13	
Friendgrove **	96	56	77.2	2.83	
Galva	90	48	70.0	3.78	
Grafton				3.58	
Greenville	99	54	74.8	4.41	
Griggsville	92	53	72.8	7.20	
Halfway	98	54	77.1	3.58	
Halliday	102	48	76.4	4.07	
Henry	88	48	69.6	5.44	
Hillsboro	96	52	73.6	5.71	
Hoopeston	92	45	69.2	2.30	
Joliet	87	47	68.4	3.15	
Kishwaukee	88	43	67.3	1.49	
Knoxville	89	46	69.0	7.90	
Lagrange	86	47	67.6	2.08	
Laharpe	93	50	70.6	9.05	
Lanark	89	42	67.6	2.26	
Loami				4.69	
McLeansboro	98	51	76.3	2.71	
Martinsville	98	51	73.0	4.57	
Martinton	93	45	69.6	2.37	
Mascoutah	95	51	72.8	4.40	
Mattoon	90	52	70.6	3.09	
Minonk	90	46	69.6	8.56	
Monmouth	91	44	69.6	8.80	
Morgan Park				2.47	
Morrison	85	49	68.2	5.32	
Morrisonville	96	51	72.8	4.43	
Mount Carmel				2.66	
Mount Pulaski	98	51	72.3	5.64	
Mount Vernon	100	50	76.4	2.85	
New Burnside	97	51	77.2	4.33	
Olney	97	54	74.4	3.20	
Ottawa	91	50	70.8	4.40	
Palestine	97	54	74.4	6.22	
Pana	93	50	71.6	5.51	
Paris	90e	50e	70.8e	4.71	
Peoria a				8.32	
Peoria b	92	56	73.0	7.42	
Philo	93	49	70.8	5.39	
Plumhill	100	51	74.8	5.04	
Rantoul	96	46	71.6	6.09	
Raum	100	53	77.6	4.20	
Riley	85	47	67.5	1.00	
Robinson	96	50	72.4	6.29	
Rockford	87	47	68.4	1.14	
Rushville	92	51	72.2	6.45	
St. Charles	88	52	69.8	2.67	
St. John	100	50	76.4	2.12	
Snobonier	96e	48e	74.6e	4.08	
Streator	91	48	69.5	7.11	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Illinois—Cont'd.	°	°	°	*Ins.*	*Ins.*
Sullivan	95	48	71.7	4.19	
Sycamore	91	46	68.8	2.27	
Tilden	99	48	74.8	4.15	
Tiskilwa	87	50	68.6	5.00	
Tuscola	95	49	71.5	5.46	
Walnut	91	49	70.4	4.63	
Wellington	89	46	70.0	1.90	
Winchester	92	53	72.4	5.63	
Winnebago	87	45	67.8	1.53	
Yorkville	88	45	68.3	2.96	
Zion	88	46	67.7	2.89	
Indiana.					
Anderson	91	47	70.8	1.01	
Angola	87	47	67.2	1.55	
Auburn	90	41	68.6	0.80	
Bloomington	94	53	73.4	4.64	
Bluffton	92	44	68.8	2.31	
Butlerville	96	49	73.0	2.94	
Cambridge City	91	43	69.2	2.41	
Columbus	97	45	72.4	1.97	
Connersville	91	45	70.2	1.49	
Crawfordsville	95	49	73.8	1.75	
Delphi	94	44	69.3	1.05	
Edwardsville	93	60	75.0	3.54	
Farmland	89	46	69.7	1.48	
Fort Wayne	94d	43d	68.6d		
Greencastle	90	50	71.4	2.73	
Greensburg	95	44	71.2	1.29	
Hammond	89	48	67.5	2.41	
Hector	90	45	69.2	1.48	
Holland	97	53	74.6	4.36	
Huntington	90	47	69.0	1.93	
Jeffersonville	97	54	75.2	2.85	
Knightstown	94	46	71.9	1.00	
Kokomo	90	48	69.6	0.62	
Lafayette	90	47	70.1	1.40	
Laporte	91	47	69.2	2.75	
Logansport	93	48	70.1	2.09	
Madison a	100	52	75.4	1.23	
Madison b				1.25	
Marengo	96	51	72.6	4.56	
Marion	92	45	70.0	2.10	
Markle	91	43	68.0	1.60	
Mauzy	93	42	70.4	1.36	
Moores Hill	95	50	75.4	1.85	
Mount Vernon	100	52	77.4	1.48	
Northfield	90	43	68.4	1.15	
Oletic	98	51	73.8	1.76	
Paoli	97	48	73.0	2.89	
Prairie Creek	97g	52g	73.4g	3.09	
Princeton	96	52	74.8	1.97	
Rensselaer	91b	45f	70.0f	1.56	
Richmond	92	42	70.0	2.07	
Rockville	91	49	70.4	5.36	
Salem	97	48	74.8	2.85	
Scottsburg	97	52	74.0	2.57	
Seymour	92	50	71.4	3.19	
Shelbyville	95	51	73.4	1.67	
South Bend	89	47	68.4	1.58	
Syracuse	92	44	69.0	2.70	
Terre Haute	98	51	73.6	2.73	
Topeka	88	43	67.1	1.72	
Valparaiso	89	46	68.4	3.77	
Veedersburg	92e	46d	69.4d	2.33	
Vevay	95	53	73.2	0.70	
Vincennes	96	52	75.0	4.68	
Washington	95	53	73.6	4.33	
Winamac	90e	40e	67.4e	1.49	
Worthington	95	50	72.8	3.05	
Indian Territory.					
Ardmore	108	63	87.6	0.87	
Chickasha	107	61	85.7	2.51	
Durant	105	66	99.0	2.44	
Fairland	99	57	79.9	6.56	
Goodwater	107	68	86.2	0.75	
Hartshorne	103	62	84.2	2.20	
Healdton	110	64	86.6	0.25	
Holdenville	104	59	83.4	1.00	
Marlow	107	63	86.2	0.95	
Muskogee	105	62	82.8	3.17	
Ryan	107	66	89.0	0.83	
South McAlester				2.04	
Tahlequah	105	56	81.3	6.14	
Tulsa				2.89	
Wagoner	103	64	83.1	3.10	
Iowa.					
Afton	96	46	71.0	5.80	
Albia	90	43	70.6	7.27	
Algona	86	45	68.6	7.49	
Allerton	93	47	71.0	11.06	
Alta	90	43	66.9	6.34	
Amana	91	49	69.0	9.41	
Ames	93	49	69.3	7.12	
Atlantic	96	40	69.8	4.75	
Baxter	94	45	69.0	6.57	
Bedford	94	45	71.8	7.38	
Belknap	92	48	69.4	6.17	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Bonaparte	93	49	70.6	8.12	
Britt	89	45	67.6	7.24	
Buckingham				10.13	
Burlington	92	50	71.6	10.62	
Carroll	97	41	69.4	5.56	
Cedar Rapids	92	50	69.9	9.93	
Chariton	92	46	70.3	8.23	
Charles City	88	47	67.6	6.71	
Chester	88	43	65.6	2.79	
Clarinda	96	45	72.5	6.76	
Clearlake	94	45	69.2	4.60	
Clinton	91	46	69.5	4.08	
College Springs	97d	46d	71.8d	6.00	
Columbus Junction	92	50	69.5	15.47	
Corning	92	43	70.3	7.83	
Council Bluffs	96	44	72.8	3.30	
Cresco	84	46	65.3	2.80	
Cumberland				5.36	
Danville				8.86	
Decorah	88	43	66.6	1.78	
Delaware	89	45	66.4	3.31	
Denison	92	43e	68.2	3.59	
De Soto	95	49	71.2	7.68	
Dows	86	46	65.2	11.10	
Earlham	94	42	68.4	8.54	
Eldon	91	49	71.1	7.18	
Elkader	91	47	69.6	2.14	
Emerson				5.05	
Estherville	84	45	66.1	6.06	
Fairfield	89	51	70.9	9.54	
Fayette	91	43	66.0	4.92	
Forest City	87	42	67.5	5.61	
Fort Dodge	90	43	67.7		
Fort Madison				7.19	
Galva	94	41	68.8	4.91	
Gilman				6.94	
Grand Meadow	89	46	67.2	1.98	
Greene	90	47	68.2	8.24	
Greenfield	89	43	69.0	5.77	
Grinnell (near)	90	48	68.6	7.45	
Grundy Center	89	45	68.3	9.81	
Guthrie Center	93	41	67.9	7.91	
Hampton	89	46	68.4	5.77	
Harlan	94	41	69.6	3.32	
Hopeville				8.37	
Humboldt	88	45	68.4	7.36	
Independence	88	46	67.3	4.42	
Indianola	94	47	70.0	9.48	
Iowa City	92	49	70.3	10.91	
Iowa Falls	88	46	67.5	7.66	
Jefferson				8.27	
Keosauqua	95	50	71.6	7.10	
Knoxville	94	49	70.3	8.03	
Lacona				8.70	
Lansing	92	45	68.6	3.18	
Larrabee	93	38	68.5	6.95	
Leclaire				6.50	
Lemars	93	41	68.2	3.65	
Lenox	90	47	70.2	6.86	
Leon	92	49	71.4	8.24	
Logan	91	42	71.1	5.36	
Maple Valley				6.34	
Maquoketa	91	44	68.6	3.57	
Marshalltown	94	46	70.0	7.87	
Monticello	92	45	67.4	3.31	
Mountayr	93	46	71.0	9.09	
Mount Pleasant	92	47	70.0	10.06	
Mount Vernon	93	47	70.0	10.65	
New Hampton	84	44	65.4	3.72	
Newton	90	47	68.6	7.06	
Northwood	83	46	66.2	5.88	
Odebolt	97	41	70.2	3.72	
Ogden	96	44	70.2	7.01	
Olin	90	46	68.0	5.34	
Onawa	94	46	71.5	4.24	
Osage	85	45	66.0	4.18	
Osceola	91e	47	70.7	7.26	
Oskaloosa	91	48	69.9	7.57	
Ottumwa	91	53	71.7	6.42	
Ovid	92	46	70.6	8.64	
Pacific Junction	93	45	72.0	5.15	
Perry	98	48	71.0	9.38	
Plover	88	38	66.6	9.48	
Primghar				4.45	
Redoak	89	51	72.1	5.71	
Ridgeway	91	48	69.4	2.66	
Rockford				6.12	
Rockwell City	94	43	68.0	7.82	
Ruthven	86	42	68.0	9.23	
Sac City	94	45	68.8	8.03	
St. Charles	92	47	70.5	7.58	
Scranton	95	46	69.2	5.70	
Sheldon	89	40	67.4	6.14	
Sibley	90	37	67.8	9.25	
Sigourney	95	46	70.4	7.53	
Sioux Center	89	42	68.2	5.05	
Stockport				8.21	
Storm Lake	90	43	67.4	5.52	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Iowa—Cont'd.					
Stuart	95	45	70.8	8.17	
Thurman	94	44	72.0	8.72	
Tipton	90	47	68.1	9.40	
Toledo	97	42	69.2	9.35	
Vinton *1	88°	54ᵈ	68.5ᶜ	8.03	
Wapello	90	52	69.0	9.55	
Washington	90	47	68.2	12.34	
Washta				3.91	
Waterloo	90	48	68.8	7.70	
Waverly	87	49	67.5	4.57	
Westbend	87	44	67.8	7.12	
Westbranch				7.71	
West Union				2.02	
Whitten	91	45	68.1	6.98	
Wilton Junction	93	47	70.8	7.60	
Winterset	91	47	70.0	8.35	
Woodburn				6.80	
Kansas.					
Achilles	110	40	73.7	4.16	
Anthony				3.36	
Atchison	98	49	76.0	7.06	
Baker	99	43	75.0	5.37	
Beloit	106	47	77.6	3.78	
Burlington	103	47	78.2	10.44	
Clay Center	104	44	78.1	10.19	
Colby	108	47	76.0	6.29	
Columbus	97	56	78.3	5.76	
Coolidge	104	51	77.7	2.71	
Cunningham	104	50	79.6	3.73	
Delphos	109	48	78.4	7.57	
Dresden	108	46	76.5	2.25	
Ellinwood	103	50	78.6	6.33	
Englewood	106	58	81.6	1.87	
Eureka				8.76	
Eureka Ranch	107	42	78.6	4.39	
Fallriver	103	57	79.1	7.38	
Farnsworth	107	42	78.0	2.89	
Fort Leavenworth	98	57	78.6	5.93	
Fort Scott	101	53	78.8	10.98	
Frankfort	103	42	77.0	7.64	
Fredonia	99	55	.79.4	9.29	
Garden City	112	47	81.3	0.88	
Gove *1				3.42	
Grenola	104	54	79.1	3.72	
Hanover	102	45	76.7	9.23	
Harrison	105	42	75.6	2.76	
Hays	108	46	77.6	6.42	
Horton	100	48	76.0	5.80	
Hoxie				6.15	
Hutchinson	104	47	77.4	8.25	
Independence	106	57	81.0	6.22	
Jetmore	108	49	78.9	2.24	
Lakin	108	48	80.1	0.34	
Lebanon	102	44	75.4	3.30	
Lebo	99	50	77.2	12.60	
Little River	105	49	77.7	6.64	
Macksville	102	48	77.8	2.64	
McPherson	108	50	80.5	6.92	
Madison	101	46	76.3	8.94	
Manhattan	105	47	78.6	10.29	
Marion	102	50	78.4	7.50	
Meade	108	54	81.0	2.82	
Medicine Lodge	106	51	81.6	2.22	
Minneapolis	106	49	77.6	7.99	
Moran	97	52	77.2	14.36	
Mounthope *1	102	60	79.2	6.73	
Ness City	109	48	81.1	3.01	
Norwich	104	52	81.0	3.95	
Oberlin				2.25	
Olathe	95	49	75.4	8.24	
Oswego	102	57	78.8	6.82	
Ottawa	100	45	75.8	6.93	
Paola				7.76	
Phillipsburg				2.51	
Pratt	105	48	79.0	5.81	
Rome	107	55	81.0	4.30	
Salina	107	48	77.4	5.81	
Sedan	100	57	79.0	6.01	
Seneca	99	45	75.6	8.34	
Toronto	104	48	78.0	9.27	
Ulysses	107	55	82.3	1.20	
Valley Falls	97ʲ	48	76.3°	6.89	
Viroqua	105	50	78.6	0.37	
Wakeeney				5.03	
Wallace	108	54		4.07	
Wamego *1	102	53	75.6	11.53	
Winfield	103	72	79.6	4.75	
Yates Center	101	49	76.4	10.83	
Kentucky.					
Alpha	98	52	75.2	4.90	
Anchorage	96	50	74.2	3.17	
Bardstown	101	52	76.6	4.25	
Berea	95	48	73.4	2.69	
Blandville	99	57	76.6	5.70	
Bowling Green	103	53	78.4	2.53	
Burnside	98	51	76.0	1.70	
Cadiz	102	52	79.2	2.24	
Carrollton	99	56	74.6	1.04	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Kentucky—Cont'd.					
Catlettsburg				1.21	
Centertown	102	47	76.6	1.71	
Earlington	98	48	76.6	1.40	
Edmonton	98	49	76.2	1.78	
Eubank	96	50	72.8	4.54	
Falmouth				2.12	
Fords Ferry	99	45	76.6	2.07	
Frankfort	95	51	73.8	1.16	
Franklin	98	56	78.9	0.90	
Greensburg	99	48	75.4	2.18	
Henderson	99	53	78.0	1.96	
High Bridge	95	52	74.8	4.52	
Hopkinsville	102	52	77.8	2.29	
Irvington	98	53	76.0	3.95	
Jackson	94	50	74.0	1.11	
Leitchfield	99	52	75.5	2.15	
Loretto	96	48	74.8	3.67	
Manchester	96	50	74.4	2.39	
Marrowbone	98	48	74.2	3.89	
Mayfield	100	56	77.9	3.00ᵇ	
Maysville	98	49	74.6	1.56	
Middlesboro	92	51	75.8	2.15	
Mount Sterling	95	49	73.4	2.21	
Owensboro	97	56	76.3	1.18	
Owenton	92	53	72.8	1.69	
Paducah a				4.02	
Paducah b	101	60	79.9	3.28	
Pikeville	97	48	76.0	1.40	
Richmond	92	53	74.2	2.15	
St. John	97	51	74.6	4.04	
Scott	98	51	74.6	0.86	
Shelby City	93	49	73.4	3.44	
Shelbyville	99	50	74.6	2.45	
Taylorsville	96	50	73.2	3.67	
Williamsburg	100	52	77.2	2.91	
Williamstown	97	53	74.0	1.35	
Louisiana.					
Abbeville	100	70	84.0	6.44	
Alexandria	107	69	86.4	2.02	
Amite	103			1.45	
Baton Rouge	99	70	84.0	3.79	
Burnside	98	70	83.4	3.46	
Calhoun	100	66	82.4	4.46	
Cameron	93	71	83.8	2.45	
Cheneyville	103	70	85.2	1.60	
Clinton	97	69	82.4	7.63	
Collinston	104	65	84.9	2.22	
Covington	101	70	85.2	4.39	
Donaldsonville	100	68	83.5	2.75	
Emilie	96	70	82.6	4.73	
Farmerville	100	64	83.5	0.20	
Franklin	99	70	84.6	7.36	
Grand Coteau	99	70	84.1	4.97	
Hammond	99	68	82.7	6.44	
Houma	99	67	83.7	5.74	
Jennings	99	69	84.0	3.35	
Lafayette	101	70	84.5	2.04	
Lake Charles	102	72	86.0	1.17	
Lake Providence	100	65	83.0	1.84	
Lakeside	98	70	84.4	4.73	
Lawrence	100	68	84.2	3.79	
Libertyhill	104	69	85.7	0.85	
Mansfield	100	61	83.3	0.02	
Melville	100	70	83.7	4.30	
Minden	103	67°	85.4	0.51	
Monroe	99	70	84.6	1.23	
New Iberia	93	73	83.4	7.10	
Opelousas	102	68	84.5	2.00	
Oxford	103°	67°	83.3ᵏ	1.00	
Paincourtville	99	70	83.0	6.52	
Plain Dealing	99	66	82.9	0.59	
Rayne	104	65	85.0	2.81	
Reserve	98	69	83.6	4.19	
Robelin	98	70	82.9	2.72	
Ruston	102	67	84.2	0.75	
Schriever	99	66	82.2	9.69	
Sugar Experiment Station	97	71	84.0	3.31	
Sugartown	98	71	84.8	4.69	
Venice	98	67	82.4	6.10	
Wallace	104	68	83.8	4.12	
Maine.					
Bar Harbor	84	45	63.8	3.24	
Belfast	82	41	63.1	4.62	
Bemis	83	43	60.7	3.71	
Calais				4.20	
Carmel	83	40	62.4	3.08	
Cornish	85	43	64.4	8.36	
Fairfield	85	43	64.4	4.06	
Farmington	85	38	63.0	3.34	
Fort Fairfield	85ᵇ	30ᵇ	63.1ᵇ	2.55	
Gardiner	89	46	65.6	4.46	
Houlton	84	40	63.0	4.09	
Kineo	79	53	65.0	3.01	
Lewiston	86	48	65.6	3.52	
Mayfield	81	42	62.4	6.36	
North Bridgton	85	43	64.4	4.21	
Orono	85	39	63.0	4.96	
Patten	85	36	61.4	3.80	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Maine—Cont'd.					
Roach River				5.32	
Rumford Falls	83	41	61.5	3.86	
The Forks				3.43	
Vanburen	91	34	62.2	2.69	
Vanceboro	83	50	67.0	2.54	
Maryland.					
Annapolis				1.45	
Bachmans Valley	88	43	69.6	1.89	
Boettcherville	97	41	71.8	2.91	
Boonsboro	92	44	70.4	1.65	
Cambridge	95	55	75.2	2.02	
Charlotte Hall	95ᵇ	53ᵇ	73.8ᵇ	1.29	
Chase	92	45	71.2	2.82	
Cheltenham	92	45	71.0	0.97	
Chestertown	87	54	72.5	1.48	
Chewsville	91	41	70.4	0.91	
Clearspring	89	49	70.5	2.11	
Collegepark	91	45	70.9	3.48	
Colora				1.77	
Cumberland b				1.59	
Darlington	92	49	71.4	1.42	
Deerpark	84°	33°	65.2°	3.70	
Denton	92	42	73.0	2.08	
Easton	89	51	73.6	2.39	
Fallston	91	50	71.6	2.10	
Frederick	92	45	72.5	1.59	
Grantsville	86	37	64.1	2.65	
Greatfalls	93	48	71.4	1.52	
Greenspring Furnace	92	46	70.9	1.35	
Hancock	100	42	71.2	2.31	
Harney				1.74	
Jewell	90	51	72.5	0.87	
Johns Hopkins Hospital	92	54	78.8	3.82	
Laurel	92	48	71.8	3.70	
McDonogh	89	47	71.6	1.51	
Mount St. Marys College	90	53	72.6	1.45	
Newmarket	89	47	71.1	2.35	
Pocomoke	92	51	72.3	4.24	
Princess Anne	90	47	71.6	2.51	
Solomons	93	58	75.2	2.08	
Sudlersville	92°	50°	73.4°	1.57	
Sunnyside	87	34	64.7	2.87	
Takoma Park	91	50	72.2	2.75	
Taneytown	93	48	72.8	0.00	
Van Bibber	89	52	72.2	1.26	
Westernport	95	44	68.8	1.76	
Woodstock	90	48	72.0	2.86	
Massachusetts.					
Amherst	87	43	66.2	4.65	
Bedford	83	48	64.9	4.66	
Bluehill (summit)	86	47	65.9	2.76	
Cambridge	89	48	67.4	2.86	
Chestnuthill	90	47	67.8	2.96	
Cohasset				1.76	
Concord	88	43	65.4	4.26	
East Templeton *1	84	51	67.0	3.06	
Fallriver	85	50	67.4	0.68	
Fitchburg a *1	84	53	65.4	3.97	
Fitchburg b	87	47	66.2	3.85	
Framingham	87	44	67.0	4.07	
Groton	85	45	54.7	4.20	
Hyannis	83	50	67.1	0.54	
Jefferson				5.50	
Lawrence	87	48	66.8	4.77	
Leominster				4.34	
Lowell a	88	48	68.0	5.16	
Lowell b	88	45	66.4		
Ludlow Center				4.50	
Middleboro	88	41	65.4	1.79	
Monson	83	42	64.4	4.30	
New Bedford a	85	48	66.7	2.09	
Plymouth *1				1.43	
Princeton				3.62	
Provincetown	85	54	68.2	0.67	
Salem				2.59	
Somerset *1	96	48	70.8	1.28	
Springfield Armory	87	47	67.5	4.62	
Sterling				3.01	
Taunton c	87	40	65.0	2.85	
Webster				3.09	
Westboro	89	46	68.8	2.93	
Weston	86	42	64.6	4.12	
Williamstown	82	44	63.8	5.14	
Winchendon				4.87	
Worcester b	88	50	67.6	3.58	
Michigan.					
Adrian	87	53	70.2	0.89	
Agricultural College	87	42	64.2	0.68	
Allegan	90ᵈ	40ᵈ	66.8ᵈ	0.55	
Alma	89	40	64.6	1.45	
Ann Arbor	88	44	67.0	0.63	
Annpere				0.00	
Arbela	88	44	65.2	2.06	
Baldwin	87	38	63.6	1.55	
Ball Mountain	86	45	64.6	1.22	
Battlecreek	88	44	67.3	0.36	
Bay City	85	47	65.0	2.55	
Benzonia	83	43	63.0	1.71	

TABLE II.—*Climatological record of voluntary and other cooperating observers—Continued.*

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Michigan—Cont'd.					
Berlin	85	45	64.4	4.02	
Berrien Springs	91	43	67.3	1.20	
Big Rapids	85	38	62.2	1.45	
Birmingham	89b	47j	68.8j	0.40	
Boon	81d	34f	59.2e	3.35	
Calumet	80	47	61.5	1.76	
Cassopolis	92	40	65.7	0.60	
Charlevoix	84	46	64.5	0.33	
Charlotte	89	41	66.3	0.65	
Chatham	83	33	58.9	3.42	
Cheboygan	86	38	62.1	1.54	
Clinton	92	43	68.4	1.14	
Coldwater	91	42	67.4	1.60	
Detour	80	45	63.0	1.35	
Dundee	87	43	66.6	1.10	
Eagle Harbor	84	44	62.0	2.02	
East Tawas	83	40	62.8	4.04	
Eloise	87	47	67.2	1.09	
Ewen	82	32	59.4	0.40	
Fairview				0.96	
Fennville	87	44	66.0	0.85	
Fitchburg	87	40	64.4	1.00	
Flint	86	43	64.2	1.50	
Frankfort	88	47	65.6	0.78	
Gaylord	83	32	60.2	1.00	
Gladwin	87	42	65.9	2.65	
Grand Marais	80	43	61.6	2.29	
Grand Rapids	92	47	67.0	0.40	
Grape	89	45	66.9	1.00	
Grayling	89	39	60.8	3.35	
Hagar	92	41	66.6	1.85	
Hanover	89	42	66.4	0.11	
Harbor Beach	84	41	62.2	2.48	
Harrison f	80	40	59.4	1.71	
Harrisville	85	41	62.8	1.79	
Hart	88	40	65.6	1.68	
Hastings	90	40	66.4	0.75	
Hayes	85	42	62.8	3.28	
Highland Station				0.96	
Hillsdale	88	40	65.6	0.44	
Humboldt	81	30	57.0	0.80	
Iron Mountain	86	37	62.2	2.16	
Iron River	86	30e	60.8e	2.15	
Ironwood				1.47	
Ishpeming	83	37	60.4	2.40	
Ivan	84	36	60.9	1.94	
Jackson	90	41	66.8	0.49	
Jeddo	85	47	64.0	2.94	
Kalamazoo	95	46	67.9	2.06	
Lake City	90	39	63.4	0.55	
Lansing	89	44	65.8	0.44	
Lapeer	86	44	65.0	2.89	
Lincoln				1.19	
Mackinac Island				3.97	
Mackinaw	86	43	64.5	2.95	
Mancelona	86	35	62.5	0.76	
Manistee	84	44	65.2	0.97	
Manistique	79	40	61.4	3.35	
Menominee	87	45	63.3	1.41	
Midland	88	38	65.4	2.35	
Mio	83	34	60.0	2.33	
Mount Clemens	87	43	66.0	0.72	
Mount Pleasant	87	42	64.6	1.67	
Muskegon	84	46	65.8	0.61	
Newberry	85	29	59.3	1.10	
North Marshall	88	43	66.4	0.40	
Old Mission	82	47	64.6	1.07	
Olivet	84	46	65.2	1.32	
Omer	84	40	63.9	1.78	
Onaway	86	36	61.8	2.31	
Ontonagon	87	40	61.3	1.67	
Ovid	87	41	65.4	0.77	
Owosso	88	42	67.6	0.42	
Petoskey	85	41	64.0	0.40	
Plymouth				0.20	
Port Austin	85	43	61.8	1.80	
Powers	87	40	63.6		
Reed City	88	40	64.4	1.95	
Roscommon	90	34	62.2		
Saginaw	86	44	66.0	2.48	
St. Ignace	85	44	64.2	3.71	
St. Johns	89e	46e	67.6e	0.42	
St. Joseph	88	47	68.6	1.59	
Sidnaw				0.30	
Somerset	87	41	65.0	T.	
South Haven	86	46	65.0	0.65	
Thomaston	85	30	58.0	1.47	
Thornville	82	47	64.8	3.21	
Traverse City	88	44	65.0	1.07	
Vans Harbor	83	40	63.3	1.13	
Vassar	85	41	64.0	1.71	
Waseph	88	44	65.4	0.86	
Waverly	87	40	67.0	0.24	
Webberville	86	42	66.4	1.24	
West Branch	84	38	61.8	1.41	
Wetmore	95	30	59.6		
Whitecloud	86	38	64.1	1.00	
Whitefish Point	79	43	62.4	2.36	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Michigan—Cont'd.					
Ypsilanti	85	41	65.6	0.44	
Minnesota.					
Ada	88	40	65.8	3.12	
Albert Lea	87	44	66.1	3.93	
Alexandria	87	41	65.2	3.07	
Angus	85	39	63.0	2.79	
Ashby	88	40	66.2	2.77	
Beardsley	95	32	66.2	2.64	
Beaulieu	85	38	62.8	2.79	
Bemidji	84	40	64.2	4.85	
Bird Island				4.91	
Blooming Prairie	86	44	65.5	3.90	
Brainerd	86	43	66.6	4.32	
Caledonia	85	45	65.4	1.99	
Campbell	92	40	67.1	2.41	
Collegeville	86	45	65.6	1.32	
Crookston	84	45	64.5	3.24	
Deephaven				5.92	
Detroit City	85	35	63.6	4.55	
Faribault	85	45	65.8	5.52	
Farmington	88	45	66.5	5.26	
Fergus Falls	89	39	66.8	1.80	
Glencoe	85	36	64.8	3.24	
Grand Meadow	89	45	66.4	4.05	
Hallock	86	39	62.8	1.72	
Hovland				3.69	
Lake Winnibigoshish	82	46	62.6	5.89	
Leech	84	40	61.9	5.29	
Long Prairie	86	40	65.3	3.11	
Luverne	84d	40d	64.2d	8.30	
Lynd	88	41	65.9	6.29	
Mapleplain	86	44	66.4	3.41	
Milaca	87	42	64.0	2.06	
Milan	96	45	66.7	1.97	
Minneapolis b	87	46	65.9	6.29	
Montevideo	94	39	66.0	4.25	
Morris	90	40	65.0	4.03	
Mount Iron	85	37	59.5	5.25	
New London	91	40	66.6	3.15	
New Richland	88	44	67.4	4.96	
New Ulm	88	45	68.2	5.87	
Park Rapids	86	38	62.8	3.61	
Pine River	86	46	65.7	10.15	
Pipestone	90	32	67.0	10.60	
Pleasant Mounds	83	44	65.9	6.01	
Pokegama Falls	87	40	61.4	5.45	
Redwing a				4.36	
Reeds				6.50	
Rolling Green	92	51	68.3	4.70	
St. Cloud	89	43	65.8	2.32	
St. Peter	87	45	68.3	4.54	
Sandy Lake Dam	85	42	63.4	4.31	
Shakopee	85	48	66.2	5.55	
Tower	85	34	59.4	4.20	
Two Harbors	85	39	58.7	2.54	
Wabasha	91	45	68.2	6.87	
Willow River	88	38	63.0	4.17	
Winnebago City	86	44	67.3	4.52	
Winona	87	45	66.7	2.92	
Worthington	82	42	65.8	7.13	
Zumbrota	84	44	66.2	0.00	
Mississippi.					
Agricultural College				1.17	
Austin	96	61	79.4	7.29	
Batesville	99	56	79.1	3.70	
Bay St. Louis	99	70	83.8	5.28	
Biloxi	97	69	84.0	4.80	
Booneville	98	59	79.6	2.60	
Brookhaven	101	67	83.8	3.15	
Canton	106	61	83.6	4.16	
Columbus a				4.78	
Corinth	99	54	79.0	5.46	
Crystalsprings	102	65	83.4	5.75	
Duck Hill	104	60	82.3	0.86	
Edwards	102	64	84.4	2.01	
Fayette	100	65	83.4	3.10	
Fayette (near) *1				5.10	
Greenville a	95	67	81.8	1.31	
Greenville b	104	66	83.0	1.79	
Greenwood	101	59	81.8	3.75	
Hattiesburg	103	67	84.8	7.16	
Hazlehurst	103	68	84.6	3.64	
Hernando	97	60	79.0	5.23	
Holly Springs	97	62	79.6	6.58	
Indianola	101	58	82.4	2.50	
Jackson	105	63	85.2	7.02	
Kosciusko	104	59	83.2	3.87	
Lake	100	64	82.1	6.35	
Leakesville	103	65	84.3	2.63	
Louisville	103	62	82.2	2.00	
Macon	105	56	80.8	2.75	
Magnolia	101	66	83.0	2.66	
Natchez	101	71	85.6	3.85	
Nittayuma	102	62	82.8	1.51	
Okolona	104	61	82.8	4.64	
Palo Alto	102	62	82.0	3.97	
Patmos				1.02	
Pearlington	100	69	83.6	7.19	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Mississippi—Cont'd.					
Pittsboro	107	58	81.8	2.23	
Pontotoc	100	60	80.9	4.42	
Port Gibson	102	63	84.6	0.90	
Ripley	99	57	79.1	1.47	
Shoccoe	98	72	84.0	6.25	
Stonington *1				2.19	
Suffolk	101	65	83.2	2.53	
Swartwout	102	67	83.5	4.59	
Thornton	102	70	84.4	0.50	
Tupelo	102	64	83.0	3.59	
University	101	61	81.3	3.03	
Walnutgrove	100	63	82.4	5.69	
Watervalley	102	63	83.5	2.52	
Woodville	100	70	84.2	3.54	
Yazoo City	105	62	83.6	6.20	
Missouri.					
Appleton City	97	53	77.0	11.08	
Arthur	96e	52	76.1e	11.49	
Avalon	96	48	75.7	6.12	
Bethany	92	47	72.0	7.56	
Birchtree	99	56	77.1	4.62	
Boonville				8.22	
Brunswick	95	53	73.6	6.21	
Carrollton				6.04	
Caruthersville	101	55	79.4	4.20	
Conception	92	52	72.2	4.28	
Cowgill **	96	58	75.2	6.25	
Darksville	95	50	73.4	5.42	
Dean	99	52	78.8	4.67	
Desoto	99	50	74.9	6.03	
Downing				7.32	
Edgehill **	94	56	75.1	7.56	
Edwards	98	53	75.6	8.24	
Eightmile **				8.31	
Eldon	96	50	74.2	6.92	
Fairport				5.11	
Fayette	94	54	73.5	6.46	
Fulton	96	51	74.2	4.88	
Galena				0.96	
Gallatin *1	94	54	74.0	5.20	
Glasgow	94	54	74.6	6.30	
Gorin				5.19	
Grant City				7.61	
Halfway	97	53	76.5	10.40	
Harrisonville	100	52	76.0	8.36	
Hazlehurst				6.62	
Hermann				4.28	
Houston	102	49	77.0	6.42	
Huntsville	93l	51	73.6e	4.38	
Ironton	101	47	75.8	7.97	
Jackson	101	50	77.4	3.19	
Jefferson City	102	52	75.8	5.06	
Joplin	97	59	80.3	6.41	
Kidder	96	47	73.7	4.07	
Koshkonong	98	57	77.2	3.84	
Lamar	100	55	78.7	8.52	
Lamonte				4.65	
Lebanon	97	55	76.2	7.25	
Lexington	96	50	75.4	5.34	
Liberty	97	49	75.2	8.16	
Louisiana	94	49	72.4	5.23	
Macon	96	50	74.2	3.92	
Marblehill	103	50	77.8	3.79	
Marshall	94	51	73.9	6.11	
Maryville	95	47	71.8	4.70	
Mexico	95	51	73.4	5.04	
Miami **	96	56	75.6	8.10	
Mineralsprings	100l	55l	79.4l		
Monroe City	90	48	71.2	5.92	
Montreal	96	49	74.4	8.19	
Mountaingrove	97	53	74.2	7.69	
Mount Vernon	100	55	79.0	4.86	
Neosho	95	53	78.4	3.50	
Nevada				10.28	
New Haven	99	55	76.1	4.86	
New Madrid b				6.51	
New Palestine	96	52	73.8	4.60	
Oakfield	98	55	75.0	5.67	
Olden	99	53	76.9	4.86	
Oregon	96	51	74.4	4.42	
Palmyra **	92	54	73.0	4.02	
Phillipsburg				6.63	
Pine Hill				5.31	
Poplarbluff	101	53	78.0	7.31	
Potosi (near)	96	47	73.4	8.10	
Princeton	98	50	73.6	8.70	
Richmond	95	53	73.3	6.79	
Rockport				2.76	
Rolla				8.20	
St. Charles	98	55	75.4	5.94	
St. Joseph				2.94	
Sarcoxie				5.46	
Sedalia	94	53	75.4	7.06	
Seymour	95	51	75.0	6.22	
Shelbina				4.39	
Sikeston	101	53	77.6	4.65	
Steffenville	97	49	73.2	5.62	
Sublett	92	47	71.4	6.07	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Missouri—Cont'd.					
Trenton	92	51	73.4	8.08	
Unionville	94	54	71.8	9.65	
Vichy	99	51	75.8	7.10	
Warrensburg	96	51	74.9	6.78	
Warrenton	98	54	74.6	4.67	
Warrenton				8.40	
Wheatland	100	48	76.4	6.18	
Willowsprings	96	50	75.2	7.86	
Windsor	101	48	77.2	7.16	
Zeitonia					
Montana.					
Adel	84	25	57.0	0.35	
Anaconda	88	34	60.4	0.01	
Augusta	86	35	61.1	0.77	
Billings	98	40	69.4		
Boulder	87	34	59.6	0.60	
Bozeman	85	33	61.4	1.13	
Butte	85	37	60.9	0.25	
Canyon Ferry	95	40	66.3	0.35	
Columbia Falls	91	29	60.8	1.88	
Crow Agency	95	40	67.2	0.90	
Culbertson	95	36	66.2	0.82	
Deerlodge	84	33	59.4		
Dillon	86	29	58.6	1.26	
Ekalaka	91	41	66.9	1.79	
Fort Benton	94	38	66.6	0.27	
Fort Logan	90	32	58.6	T.	
Glasgow	98	33	70.2	0.32	
Glendive	102	40	68.7	2.50	
Greatfalls	89	43	67.0	0.55	
Kipp	86	27	57.8	0.68	
Lewistown	90	31	61.0	0.70	
Livingston	94	37	66.4	1.00	
Manhattan	90c	31c	62.6c	0.00	
Marysville	90c	37c	62.9c	0.92	
Missoula	93	37	66.2	0.25	
Ovando	88	29	57.1	1.18	
Plains	91	34	63.2	0.78	
Poplar	99	38	69.0		
Ridgelawn	94	38	67.6	0.84	
St. Pauls	90	36	64.2	2.31	
St. Peter	88	29	59.4	0.43	
Springbrook	101	33	61.1	1.87	
Toston	89	36	62.4	0.61	
Townsend	91	35	62.6	0.44	
Troy	92	30	61.0	0.61	
Twin Bridges	88c	31c	60.2c	0.65	
Twodot	94	32	61.2	T.	
Utica		34		0.67	
Yale	91	35	64.6	0.87	
Nebraska.					
Agate				0.22	
Agee*1	95	46	68.6	8.67	
Albion	94	42	69.4	3.88	
Alliance	102	42	72.2	2.00	
Alma	106	41	76.4	1.51	
Ames	94	42	72.0	2.68	
Ansley	100	40	71.9	3.12	
Arapahoe	100	58	76.8	1.44	
Arborville*1	92	50	69.8	4.21	
Arcadia	96	40	70.2		
Ashland a	94	46	72.8	5.41	
Ashland b*1	88	45	69.8	5.40	
Ashton				4.43	
Auburn	98	42	74.3	3.18	
Aurora	97	49	71.8	2.08	
Bartley				2.20	
Beatrice	100	42	75.0	3.97	
Beaver	104	42	75.6	1.53	
Bellevue				4.66	
Benedict				4.92	
Benkleman*1				1.93	
Blair	92	46	68.8	3.75	
Bluehill*1	101	50	75.1	2.60	
Bradshaw				5.01	
Bridgeport	107	43	74.3	2.93	
Brokenbow	97	39	70.4	2.75	
Burchard				3.34	
Burwell				3.89	
Callaway	98	35	71.0	1.35	
Central City				4.63	
Chester				6.34	
Cody				1.62	
Columbus	91	46	70.3	2.40	
Crete	98	45	73.0	2.42	
Culbertson				1.13	
Curtis	97b	45b	74.0b	2.35	
Dannebrog				3.85	
David City	93	49	71.8	2.07	
Dawson	98	46	75.3	3.44	
Edgar	104	50	75.8	4.53	
Ericson				3.95	
Ewing				2.50	
Fairbury	103	40	73.7	7.72	
Fairmont	100	42	71.6	2.27	
Fort Robinson	99	40	71.4	1.52	
Fremont	91	43	70.4	2.89	
Fullerton				4.45	
Geneva	100	40	72.2	3.06	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Nebraska—Cont'd.					
Genoa (near)	92	44	70.6	1.99	
Gering	98	42	71.4	1.00	
Gordon				0.85	
Gosper				2.55	
Gothenburg	100	44	72.9	2.01	
Grand Island b	98	44	73.0	2.56	
Grand Island c	100	44	73.3	2.04	
Greeley				3.90	
Guide Rock	100	45	75.6	2.59	
Haigler				2.32	
Hartington	92	44	68.5	4.72	
Harvard	95	44	72.0	2.54	
Hastings*1	98	47	72.2	2.39	
Hayes Center				2.39	
Hay Springs	97	37	70.9	1.98	
Hebron	101	43	73.8	7.35	
Hickman				4.12	
Holbrook				1.62	
Holdredge	99	48	74.0	2.85	
Hooper*1	91	48	70.6	3.87	
Imperial	101	45	73.7	1.42	
Kearney	101	45	76.4	2.57	
Kennedy	95	37	69.1	4.66	
Kimball	96	40	69.7	2.04	
Kirkwood*1	94c	49c	68.4c	8.74	
Laclede	95	44	71.2	2.64	
Lexington	99	41	70.7	3.39	
Lodgepole	95	40	70.1	1.27	
Loup	95	41	71.2	5.03	
Lynch	100	35	71.6	6.50	
Lyons				4.55	
McCook*1	102	52	75.2	1.85	
McCool				2.33	
Madison	94	43	69.6	4.04	
Marquette				3.17	
Mason City				2.90	
Minden a	98	41	71.6	2.96	
Monroe				2.17	
Nebraska City b*1	96	54	73.2	4.80	
Nemaha				2.90	
Nesbit	101	42	70.6	3.50	
Norfolk	96	39	70.3	5.18	
North Loup	96	40	71.2	4.36	
Oakdale	94	39	69.9	3.28	
Odell				6.47	
O'Neill	96	40	69.0	5.25	
Ord				5.33	
Osceola				3.52	
Palmer				4.68	
Palmyra*1	94	50	71.4	3.78	
Plattsmouth b	93	48	71.0	6.61	
Purdum	100	38	70.1	6.98	
Ravenna a	94	44	71.8	3.42	
Redcloud	103	43	73.8	1.99	
Republican*1	102	58	78.1	1.54	
Rulo				3.99	
St. Libory				4.73	
St. Paul	96	43	73.6	5.38	
Salem*1	102	52	74.8	2.80	
Santee	94	42	71.0	5.73	
Schuyler				2.63	
Seward	94	45	71.4	5.09	
Smithfield				2.23	
Spragg				5.23	
Springview	92	42	68.3	5.45	
Stanton	93	41	69.4	6.46	
State Farm	95	44	73.2	4.30	
Strang*1	102	54	74.4	2.45	
Stratton				2.26	
Superior	102	45	74.6	5.14	
Syracuse				3.15	
Tablerock*1	98	44	75.6	2.90	
Tecumseh b	101	46	73.0	3.16	
Tecumseh c				2.98	
Tekamah	94	45	72.3	5.44	
Turlington	94	45	72.2	4.73	
Wakefield	95	40	69.7	4.21	
Wallace				2.00	
Weeping Water	90	41	69.6	3.31	
Westpoint	94	43	70.6	4.00	
Wilber*1	98	48	74.1	2.71	
Willard				2.60	
Wilsonville				3.16	
Winnebago				4.07	
Wisner				4.23	
Wymore				3.02	
York	98	46	74.7	4.20	
Nevada.					
Amos	102	33	66.8	0.00	
Austin	89	42	64.8	0.32	
Battle Mountain	107	36	71.0	0.10	
Belmont	90	41	64.3	0.74	
Beowawe*1	103	50	73.3	0.10	
Butler	96	31	64.2		
Candelaria	102	49	72.8	0.90	
Carson City	97	36	65.3	0.27	
Cranes Ranch				0.10	
Elko (near)	100	32	65.8	0.10	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Nevada—Cont'd.					
Ely	95	34	65.0	0.26	
Eureka	99	40	67.8	T.	
Fenelon*1	96	50	71.6	T.	
Golconda*1	97	42	72.6	0.37	
Halleck*1	97	40	66.9	0.25	
Hawthorne	99	50	72.2	0.00	
Humboldt	96	43	68.6	T.	
Lewers Ranch	99	41	67.2	0.28	
Lovelocks	98	57	77.0	0.00	
Martins	106	36	65.8	0.17	
Mill City*1	100	48	75.0	0.00	
Monitor Mill	92	30	62.8	0.28	
Morey	103	44	70.6	0.35	
Palisade	98	35	67.5	0.00	
Palmetto	92	37	62.9	2.13	
Potts	96	40	66.6	0.06	
Reno State University	96	43	67.2	0.42	
Rioville	117	53	86.2	0.22	
Silverpeak	100	50	72.2		
Sodaville	105	50	75.4	0.22	
Tecoma				0.00	
Toano*1	98	53	79.8	0.00	
Wabuska	102	38	68.2	0.50	
Wadsworth	98	48	73.8	0.15	
Wells*1	98	44	68.2	0.00	
Wood	91	39	63.7	0.02	
New Hampshire.					
Alstead	83	40	63.0	3.53	
Berlin Mills	92	33	61.1	4.32	
Bethlehem	84	40	60.8	3.39	
Brookline*1	86	40	65.3	5.64	
Chatham	84	40	61.8	3.80	
Claremont	87	39	64.6	4.28	
Concord	87	40	63.8	5.20	
Durham	84	42	65.0	5.81	
Franklin Falls	83	42	63.7	4.99	
Grafton	86	33	63.2	3.36	
Hanover	85	40	63.2	3.38	
Keene	86	37	63.8	4.26	
Littleton	83	40	61.0	2.81	
Nashua	91	42	67.4	7.12	
Newton	85	41	64.0	4.09	
Peterboro	87	37	63.4	4.64	
Plymouth	91	40	63.8	3.86	
Sanbornton	84	41	63.0	6.14	
Stratford	84	36	61.6	5.16	
New Jersey.					
Asbury Park	88	52	70.8	3.32	
Barnegat	91	49	71.4	1.87	
Bayonne	91	52	72.0	2.74	
Belvidere	85	47	68.9	4.11	
Bergen Point	87	50	70.4	2.90	
Beverly	91	49	71.6	7.23	
Blairstown	88	43	68.2	2.64	
Bridgeton	91	50	73.6	2.55	
Camden	90	53	73.0	4.26	
Canton				1.31	
Cape May C. H.	89	49	72.0	2.64	
Charlotteburg	85	41	67.0	4.09	
Chester	89	46	67.0	4.75	
Clayton	90	48	71.1	2.26	
College Farm	88	49	70.1	6.29	
Culvers Lake				3.93	
Dover	88	45	67.9	5.31	
Egg Harbor City	90	48	70.4	3.08	
Elizabeth	89	49	70.9	2.61	
Englewood	87	53	71.4	3.81	
Flemington	90	50	70.6	4.02	
Freehold	88	48	69.4	3.84	
Friesburg	91	46	71.2	1.71	
Hanover	84	48	67.9	9.50	
Hightstown	87	51	70.8	3.05	
Imlaystown	90	51	71.5	3.93	
Indian Mills	93	47	71.4	2.70	
Lakewood	88	48	69.1	3.14	
Lambertville	88	50	70.8	4.46	
Layton	86b	40b	66.3b	2.97	
Moorestown	88	49	70.6	8.44	
Mount Pleasant				4.19	
Newark	88	51	70.4	2.00	
New Brunswick	89	50	71.6	5.51	
New Egypt				2.42	
Newton	89	44	68.6	3.49	
Oceanic	83	54	70.0	4.77	
Paterson	85	51	70.2	6.19	
Pemberton	90	47	70.4	2.97	
Perth Amboy	89c	51c	70.4c	4.23	
Plainfield	89	47	69.9	3.87	
Rancocas				7.14	
Ringwood	88	42	66.8	3.80	
Rivervale	87	42	67.3	2.62	
Roseland	88	44	67.8	5.89	
Salem	93	48	72.8	1.90	
Somerville	90	46	69.8	8.30	
South Orange	86	50	68.7	2.91	
Sussex	84	45	67.2	2.92	
Three Bridges				3.23	
Trenton	87	50	71.0	10.67	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
New Jersey—Cont'd.	°	°	°	*Ins.*	*Ins.*
Tuckerton	90	45	70.8	2.48	
Vineland	91	50	70.8	2.10	
Woodbine	88	46	70.3	2.32	
Woodstown				1.80	
New Mexico.					
Alamagordo	105	49	79.7	3.39	
Albert	103	55	78.0	2.58	
Albuquerque	97	54	74.2	0.70	
Arabella	94	52	72.3	3.04	
Aztec	104	44	73.4	1.51	
Bellranch				2.38	
Bluewater	99	49	67.6	3.00	
Cambray				1.72	
Carlsbad	101	60	80.7	4.02	
Deming				1.61	
Dorsey	93	49	68.9	2.89	
East View	93	40	67.2	4.93	
Engle	97	58	75.2	3.32	
Espanola	101b	50a	72.0d	2.49	
Folsom	92	45	67.8	1.71	
Fort Bayard	90	53	70.2	7.13	
Fort Stanton	92	49	68.2	1.87	
Fort Union	94	43	68.3	3.05	
Fort Wingate	95	47	68.9	1.72	
Fruitland	109	39	75.5	0.31	
Gage				3.02	
Galisteo	96	51	70.8	1.49	
Gallinas Spring	100	56	76.0	1.51	
Horse Springs	92	40	65.8	3.24	
Las Vegas	97	48	69.6	1.83	
Las Vegas Hot Springs	93	48	68.1	2.50	
Lordsburg				2.55	
Mesilla Park	102	59	76.6	5.77	
Raton	90	48	66.4	3.50	
Roswell	97	58	76.1	1.80	
Strauss				1.47	
Taos	98	48	69.8	2.57	
Winsors Ranch	86	34	58.2	3.97	
Woodbury	102	52	73.8	2.29	
New York.					
Adams				3.08	
Addison	89	43	66.2	2.91	
Adirondack Lodge	75	35	55.6	6.05	
Akron				2.22	
Alden	86	46	65.4	1.64	
Angelica	88	39	64.2	3.35	
Appleton	90	48	66.0	1.76	
Arcade	83	38	61.2	2.95	
Athens	85	47	66.8	2.66	
Atlanta	89	38	63.7	1.93	
Auburn	89	47	67.2	3.44	
Avon	89	43	64.4	1.95	
Axton	85	30	59.0	3.70	
Baldwinsville	87	47	66.6	2.03	
Bedford	88	48	70.0	1.48	
Blue Mountain Lake				5.30	
Bolivar	88	35	62.6	2.68	
Bouckville	85	43	64.4	3.13	
Brockport	88	49	65.8	2.73	
Browns Station				1.19	
Caldwell	82	44	64.4	2.82	
Canaan Four Corners	84	41	63.1	3.23	
Canajoharie	88	41	64.8	2.11	
Carmel	86	47	68.5	2.76	
Carvers Falls	85	43	63.6	3.48	
Cedarhill	86	44	66.8	4.43	
Cooperstown	81	41	63.0	3.05	
Cortland	88	42	65.1	3.68	
Cutchogue	89	55	70.6	1.77	
Dekalb Junction				2.14	
Easton				4.35	
Elba	83	47	63.6	2.29	
Elmira	93	44	68.3	2.91	
Fayetteville	90	46	66.2	4.17	
Franklinville	85	39	63.0	2.31	
Gabriels	83	36	59.4	3.12	
Gansevoort				2.08	
Glens Falls	87	45	67.0	1.55	
Gloversville	88	42	64.3	2.09	
Greenwich	85a	42a	65.0	2.85	
Griffin Corners	83	35	61.2	5.23	
Harkness	85	43	66.8	2.00	
Haskinville				1.80	
Hemlock	85	51	66.1	1.48	
Honeymead Brook	84	43	66.0	1.31	
Humphrey	82	40	61.5	3.38	
Indian Lake	86	32	59.2	4.14	
Ithaca	88	43	65.6	3.14	
Jamestown	88	41	65.0	2.71	
Keene Valley	86	36	61.0	2.72	
King Ferry				2.52	
Liberty	83	41	63.8	3.65	
Littlefalls, City Res	87	43	64.9	2.12	
Lockport	85	49	65.3	1.92	
Lowville	86	40	62.7	3.55	
Lyndonville				2.85	
Lyons	90a	45a	67.8a	2.22	
Meredith	80	41	61.1	2.68	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
New York—Cont'd.	°	°	°	*Ins.*	*Ins.*
Middletown	82	50	67.6	4.49	
Mohonk Lake	79	49	65.2	2.86	
Moira	87	42	64.6	2.98	
Newark Valley				2.87	
New Lisbon	84	37	61.5	3.93	
North Hammond	82	44	66.0	1.92	
Number Four	79	35	59.4	5.48	
Nunda	90	42	65.0	1.25	
Ogdensburg	86	48	65.6	2.17	
Old Chatham				3.78	
Oneonta	94	41	65.5	2.54	
Oxford	85	43	64.0	2.62	
Palermo				3.57	
Penn Yan	90	48	66.8	1.35	
Perry City	86	40	63.6	4.82	
Plattsburg Barracks	86	44	65.5	2.70	
Port Jervis	87	45	68.1	3.67	
Primrose	89	46	68.8	2.06	
Redhook				3.07	
Richmondville	88	41	64.7	3.05	
Ridgeway	85	50	65.6	3.15	
Rome	84	43	65.8	4.14	
Romulus	88d	49d	66.8d	2.43	
Salisbury Mills	94	44	68.0	2.04	
Saranac Lake	82	37	60.4	4.28	
Saratoga Springs	89	42	66.5	3.63	
Scottsville				1.78	
Setauket	84	55	70.0	0.85	
Shortsville	88	49	65.5	1.86	
Skaneateles				2.79	
Southampton	85	53	68.2	1.84	
South Canisteo	88	37	64.4	2.56	
South Kortright	85	36	62.4	3.55	
South Schroon	82	41	61.6	4.23	
Speer Falls	86	46	65.6	1.56	
Straits Corners	88	38b	64.2d	3.84	
Ticonderoga	85	47	65.2	4.46	
Volusia	85	45	63.4	0.79	
Walton	86	39	63.3	2.36	
Wappinger Falls	85	41	67.7	2.58	
Warwick				1.53	
Watertown	87	43	66.3	1.91	
Waverly	91	40	66.6	2.36	
Wedgwood	87	45	65.0	3.70	
Wells	88	36	63.0	2.83	
West Berne	86	36	63.5	3.08	
Westfield b	88	49	65.4	1.26	
Westfield c	87c	49c	66.2a	1.60	
Windham	87	38	62.3	4.11	
Wolcott	90	46	66.4	4.20	
North Carolina.					
Biltmore	86	56	70.8	2.17	
Brevard	94	54	72.2	3.23	
Brewers	93	52	73.8	3.13	
Bryson City				3.83	
Chapelhill	105	56	78.6	3.71	
Cranberry	77	52	67.6	3.19	
Currituck				5.71	
Edenton		50		6.85	
Fayetteville	98	54	77.4	2.80	
Flatrock	93	48	71.4	4.20	
Goldsboro	97	55	76.4	4.97	
Graham				2.12	
Greensboro	94	59	75.3	5.61	
Henderson	97	56	76.1	3.73	
Hendersonville	95	51	72.6	3.26	
Henrietta	100	57	77.8	2.23	
Highlands	85	52	69.0	2.10	
Horse Cove	89	56	70.8	2.10	
Hot Springs	92	52	75.2		
Kinston	99	52	78.6	8.91	
Lenoir	96	51	74.8	0.90	
Linville	81	39	64.0	2.95	
Littleton	98	52	75.4	1.91	
Louisburg	97	53	76.6	3.45	
Lumberton	98	57	78.2	4.49	
Marion	100	53	75.8	1.00	
Marshall				5.35	
Mocksville	96	55	75.1	3.24	
Moncure	101	52	77.4	2.26	
Monroe	98	51	76.4	5.49	
Morganton	97	53	75.9	1.10	
Mountairy	92	52	73.4	4.12	
Murphy				2.22	
Newbern	95	53	77.8	7.96	
Patterson *⁴	90	50	68.7	2.27	
Penelo	97	54	77.3	4.05	
Pittsboro	95	53	75.0	3.11	
Reidsville	99	56	76.4	2.45	
Rockingham	95	58	76.8	8.61	
Roxboro	98	53	75.7	2.46	
Salem	94	55	76.2	3.67	
Salisbury	100a	59a	78.0a	4.03	
Saxon	99	54	74.2	2.58	
Selma	103	53	77.6	4.17	
Settle	95	59	76.8	3.57	
Sloan	95	48	76.4	6.11	
Soapstone Mount	95	50	74.2	2.53	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
North Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Southern Pines a	102	57	79.8	3.57	
Southern Pines b	97	59	77.4	5.14	
Springhope *1	95	58	75.1	4.14	
Statesville	96	53	75.0	3.38	
Tarboro	104	54	79.7	5.86	
Washington				6.33	
Waynesville	93	50	72.4	1.43	
Weldon a	96	57	75.4	4.45	
Weldon b				4.63	
North Dakota.					
Amenia	86	36	64.7	2.61	
Ashley	93	26	64.5	2.41	
Berlin	91	31	62.4	5.21	
Bottineau	87	33	61.2	1.00	
Buxton	84	39	63.6	2.88	
Churchs Ferry	87	37	63.7	2.17	
Coalharbor	90	39	66.0	3.23	
Devils Lake	88	39	65.0	3.00	
Donnybrook				1.90	
Dunseith	84	31	59.2	1.96	
Edgeley	95	35	65.6	4.84	
Ellendale	93	36	66.6	2.55	
Fargo	88	32	63.7	2.90	
Forman	94	31	63.6	4.46	
Fort Yates	94	35	68.1	2.00	
Fullerton	93	33	65.2	2.71	
Gallatin	87	30	60.6	2.63	
Glenullin	93	41	66.2	3.44	
Grafton	86	42	63.6	0.67	
Hamilton	88	32	61.0	1.25	
Hannaford	85	33	63.4	2.72	
Jamestown	90	33	65.0	2.73	
Langdon	85	35	61.6	0.47	
Larimore	83	37	61.6	4.01	
Lisbon	95	35	65.2	4.68	
McKinney	93	30	62.7	0.68	
Medora	96	36	66.9	1.89	
Melville	88	35	64.2	3.08	
Milton	86	36	61.8	0.64	
Minnewaukon	88	35	64.4	3.24	
Minot	96	40	66.4	1.12	
Minto	87	31	61.7	0.75	
Napoleon	95	33	66.8	2.36	
New England	96	40	65.5	1.90	
Oakdale	95	41	66.6	0.89	
Pembina	87	41	62.8	1.34	
Portal	90	37	63.8	2.03	
Power	89	34	64.9	3.56	
Steele	91	36	66.1	1.83	
University	83	42	62.2	3.15	
Valley City	88	34	63.6	0.77	
Wahpeton	90	34	66.4	1.90	
Willow City	90	31	62.8	1.19	
Woodbridge	89	33	63.0	0.36	
Ohio.					
Akron	88	46	66.5	1.54	
Annapolis	86	45	66.9	2.21	
Atwater	82	42	64.7	1.62	
Bangorville	91	43	67.5	1.46	
Bellefontaine	88	50	68.5	2.51	
Bement				3.23	
Benton Ridge	90	43	68.0	1.95	
Bethany	96	48	73.6	0.95	
Binola				3.05	
Bladensburg	89	42	67.9	3.28	
Blaine				3.31	
Bloomingburg				0.41	
Bowling Green	90	41	67.1	0.18	
Bucyrus	88	44	68.0	0.87	
Cambridge	92	43	67.8	2.02	
Camp Dennison	97	46	72.4	1.01	
Canal Dover	90	42	67.4	2.02	
Canton	89	44	67.0	3.42	
Cardington	90	41	67.0	1.62	
Cedarville				0.98	
Chillicothe	99	45	75.3	0.55	
Circleville	94	47	71.4	1.79	
Clarksville	94	45	72.5	0.46	
Cleveland a	87	49	66.8	1.68	
Cleveland b	89	49	67.2	1.72	
Clifton	91	43	69.9	1.04	
Coalton	94	43	71.0	0.55	
Colebrook	86	43	64.4	1.92	
Dayton a				0.43	
Dayton b	95	43	71.9	0.71	
Defiance	92	42	67.4	0.78	
Delaware	93	40	68.4	1.66	
Demos	93	53	73.6	5.86	
Dunham				1.74	
Elyria	90	47	67.2	2.68	
Findlay	94	44	69.7	1.74	
Frankfort	92	42	69.2	0.45	
Fremont	92	46	68.3	1.28	
Garrettsville	88	42	65.4	2.06	
Granville	93	42	69.2	1.55	
Gratiot	90	44	68.6	1.57	
Green	95	47	72.4	1.00	
Greenfield	92	50	72.1	1.11	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Ohio—Cont'd.					
Greenhill	89	40	65.5	3.19	
Greenville	91	45	70.4	1.89	
Hanging Rock	95	49	72.6	1.61	
Hedges	92	42	66.4	3.73	
Hillhouse	86	43	65.0	1.58	
Hudson	90	42	66.6	2.60	
Jacksonboro	95	47	72.5	0.84	
Killbuck	90	46	67.2	1.41	
Lancaster	92	44	68.9	1.19	
Lima	90	45	68.6	2.11	
McConnellsville	94	44	70.0	1.65	
Manara	91	43	69.8	0.90	
Mansfield				0.93	
Marietta	89	50	71.1	3.49	
Marion	91	43	69.0	1.49	
Medina	90	42	67.7	1.99	
Milfordton	89	43	67.0	2.63	
Milligan	92	41	68.8	1.50	
Millport	87	42	66.6	3.26	
Montpelier	89	44	65.4	1.28	
Napoleon	90	45	68.6	0.52	
New Alexandria	92	44	69.7	2.30	
New Berlin	90	43	67.3	2.56	
New Bremen	93			2.71	
New Lexington				1.35	
New Richmond	96	50	74.2	0.67	
New Waterford	90	44	66.7	2.30	
North Royalton	87	45	66.1	3.03	
Norwalk	91	37	67.0	0.48	
Oberlin	92	43	66.8	1.16	
Ohio State University	91	43	68.8	1.54	
Orangeville	89	40	65.1	0.46	
Ottawa	89	43	67.6	1.83	
Pataskala	92	42	69.0	0.99	
Philo	95	46	71.0	1.32	
Plattsburg	92	45	70.5	1.75	
Pomeroy	94	48	71.4	2.70	
Portsmouth a				0.83	
Portsmouth b	95	51	74.6	0.81	
Pulse				1.00	
Red Lion				1.07	
Richfield				3.24	
Richwood	91	42	69.6	2.41	
Ripley	93	48	71.1	1.71	
Rittman	95	40	66.4	0.99	
Rock				2.68	
Rockyridge	90	46	67.8	0.54	
Shenandoah	88	43	66.0	0.81	
Sidney	92	43	70.1	2.04	
Somerset	95	49	72.7	1.89	
Springfield				0.97	
Strongsville				4.52	
Swanton				0.40	
Thurman	92	48	71.6	2.19	
Tiffin	89	47	68.2	1.17	
Upper Sandusky	90	43	68.8	0.73	
Urbana	86	43	67.2	1.49	
Vickery	91	43	67.5	1.26	
Walnut				1.90	
Warren	90	43	66.5	1.28	
Warsaw	92	39	67.6	1.73	
Wauseon	92	44	68.6	0.86	
Waverly	95	47	72.8	0.84	
Waynesville	93c	44c	70.8c	0.65	
Wellington	91	43	67.4	0.82	
Willoughby				0.74	
Wooster	88	40	66.4	1.87	
Zanesville				1.42	
Oklahoma.					
Ames	107	63	85.2	1.59	
Arapaho	110	60	86.4	1.52	
Beaver	110	54	84.7	1.37	
Blackburn	105	60	82.6	3.40	
Burnett	107	57	84.6	3.75	
Chandler	104	61	81.6	2.65	
Clifton	107	59	84.8	2.93	
Cloud Chief	106	58	84.4	2.87	
Enid	106	61	84.0	2.37	
Fort Reno	107	52	83.0	0.43	
Fort Sill	105	61	84.6	0.95	
Guthrie	103	60	83.6	1.52	
Hennessey	107	61	86.2	1.43	
Jefferson	108	61	83.8	3.50	
Jenkins	106	58	82.8	0.31	
Kenton	105	50	78.0	1.03	
Kingfisher	106	61	85.2	2.00	
Mangum	114	66	88.2	2.20	
Newkirk	106	62	83.6	3.92	
Norman	105	60	83.8	2.63	
Pawhuska	112	57	83.5	5.95	
Perry	105	62	84.6	1.94	
Sac and Fox Agency	107	61	85.6	2.61	
Shawnee	105	60	83.9	2.32	
Stillwater	104	60	83.2	2.17	
Taloga	111	58	85.4	0.80	
Waukomis	107	61	85.0	2.74	
Weatherford	110	60	85.4	0.84	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Oregon.					
Albany a	99	49	65.6		
Albany b				0.16	
Alpha	100	34	62.6	T.	
Arlington	101	46	72.6	0.00	
Ashland	102	41	68.1	2.10	
Aurora *1	95	50	68.0		
Aurora (near)	99	38	64.4	0.14	
Bay City	76	40	57.4	0.95	
Bend	95	26	60.1	0.12	
Beulah	105	30	67.6	0.22	
Blackbutte	97	40	66.0	0.02	
Blalock	107	51	77.1	0.00	
Brownsville *1	98	50	67.8	0.08	
Bullrun				1.18	
Cascade Locks	98	43	67.1	0.27	
Comstock *1	93	42	61.6	0.00	
Coquille				T.	
Corvallis	102	43	66.0	0.00	
Dayville	95	36	65.3	0.24	
Detroit	106	32	65.4	0.47	
Doraville	98	41	64.0	0.49	
Ella				T.	
Eugene	97	42	65.2	0.17	
Fairview	93	35	59.8	0.02	
Falls City	100	39	63.2	0.02	
Gardiner	89	44	66.6	0.00	
Glenora	100	35	63.0	0.55	
Government Camp	87	32	55.6	1.35	
Grants Pass	107	37	69.6	T.	
Hare	84	46	60.6	0.08	
Heppner	100	36	67.0	0.11	
Hood River (near)	101	42	66.5	0.01	
Huntington	103	48	77.2	0.38	
Jacksonville	105	42	70.6	1.92	
Joseph	88	32	60.4	1.42	
Junction City *1	99	52	68.3	0.00	
Kerby	105	39	68.0	0.13	
Klamath Falls	101	32	68.3	1.75	
Lafayette *1	105	52	69.8	0.00	
Lagrande	102	37	66.2	1.25	
Lakeview	102	30	61.6	0.18	
Lonerock	94	35	63.0	0.54	
McKenzie Bridge	107	33	64.5	0.05	
McMinnville	101	39	64.7	0.02	
Monmouth a *1	99	46	63.2	T.	
Monroe	99	44	66.2	T.	
Mount Angel	100	44	66.6	0.04	
Nehalem				0.80	
Newberg	101	39	64.8	0.14	
Newport	73	44	56.5	0.15	
Pendleton	104	40	71.3	0.15	
Pine	105c	29c	65.4c	0.95	
Placer				0.00	
Prineville	99	34	64.4	0.46	
Riddles *1	105	48	65.0	0.00	
Riverside	100	30	68.0	0.17	
Sheridan *1	104	45	64.6	0.00	
Silverton	104	50	66.0	0.09	
Siskiyou *1	100	47	68.2	1.64	
Sparta	96	36	70.2	0.90	
Springfield *1	95	49	67.2	0.00	
Stafford	103	45	68.0	0.17	
The Dalles	101	46	71.0	0.00	
Toledo	97	38	62.6	0.10	
Umatilla	105	47	75.6	0.08	
Vale	101	30	67.4	0.28	
Warm Spring	102	36	68.0	0.11	
Westfork *1	105	40	64.0	0.00	
Weston	96	35	65.9	0.27	
Williams	101	36	67.6	0.30	
Pennsylvania.					
Aleppo	90	42	68.0	2.99	
Altoona	90	42	67.0	1.12	
Athens	90	41	66.2	2.17	
Beaver Dam				2.39	
Bellefonte	90	45	68.9	1.23	
Brookville				0.94	
Browers Lock				3.04	
California	91	47	70.0	1.85	
Cassandra	86	39	64.2	2.14	
Clarion				2.26	
Coatesville	92	47	71.4	2.78	
Confluence				2.17	
Davis Island Dam				1.59	
Derry Station	89	41	67.6	3.53	
Doylestown				5.14	
Driftwood				2.74	
Duncannon				3.92	
Dushore	86	36	63.4	3.28	
Dyberry	86	39	62.3	3.08	
East Bloomsburg				1.50	
East Mauch Chunk	93	41	68.0	3.64	
Easton	86	48	68.6	3.65	
Ellwood Junction				2.79	
Emporium	85	44	65.9	2.49	
Ephrata	91	47	70.9	6.44	
Everett	92f	41f	66.8f	2.36	
Forks of Neshaminy *1	86c	58c	69.2c	4.59	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Pennsylvania—Cont'd.					
Franklin	88	43	65.4	1.19	
Freeport				2.43	
Girardville				2.83	
Greensboro				2.02	
Hamburg	89	48	70.0	1.53	
Hamlinton	86	42	65.0	3.13	
Hawthorn	95	41	67.8	1.04	
Herrs Island Dam				1.77	
Huntingdon a				0.91	
Huntingdon b	100	43	68.8	1.72	
Irwin	92	34	67.6	2.16	
Johnstown	95	44	69.4	2.49	
Keating				2.30	
Kennett Square b	87	49	71.8	2.12	
Lansdale				3.15	
Lawrenceville	91	40	65.3	2.14	
Lebanon	89c	45c	69.1c	5.49	
Leroy	88	44	65.9	4.31	
Lewisburg	92	45	68.5	2.12	
Lockhaven a	92	46	70.0	1.86	
Lockhaven b				2.57	
Lock No. 4				2.52	
Lycippus	87	48	68.8	2.26	
Mifflin				0.30	
Oil City				2.02	
Ottsville				1.37	
Parker				2.24	
Philadelphia	90	55	73.0	3.21	
Pocono Lake	83	39	62.3	3.41	
Point Pleasant				3.21	
Pottsville				5.05	
Quakertown	90	44	69.4	3.32	
Reading 2			69.2	4.31	
Renovo a	88	46	67.6	1.51	
Renovo b				1.41	
Saegerstown	90	40	64.8	1.91	
St. Marys	87	43	63.8	1.43	
Saltsburg				2.10	
Seisholtzville				6.17	
Selinsgrove	89	45	68.8	1.69	
Shawmont				2.90	
Smethport	86	40	64.0	1.25	
Smiths Corners				2.87	
Somerset	90	38	63.6	2.72	
South Eaton	87	44	66.2	2.27	
Spring Mount				1.94	
State College	87	45	65.9	1.37	
Sunbury				0.95	
Swathmore	88f	52f	71.0f	3.94	
Towanda	88	43	66.6	2.02	
Troutrun				2.76	
Uniontown	90	50	70.6	2.63	
Warren	87	41	65.4	0.68	
Wellsboro	88	42	66.2	1.29	
Westchester	88	52	71.8	4.12	
West Newton				1.42	
Wilkesbarre	89	44	68.2	1.89	
Williamsport	88	46	68.2	1.63	
York	93	46	71.1	4.22	
Rhode Island.					
Bristol				0.66	
Kingston	90	44	66.8	1.69	
Pawtucket	90	52	70.2	2.68	
Providence a	91	53	70.1	2.39	
Providence c	88	49	68.0	2.58	
South Carolina.					
Aiken	101	58	78.8	7.75	
Allendale	99	63	76.0	3.35	
Anderson	102	60	79.0	3.19	
Barksdale	101	62	79.0	2.25	
Batesburg	98	60	76.7	8.68	
Beaufort	99	65	80.6	5.62	
Blackville	101	61	80.1	5.12	
Bowman	100	58	78.4	4.63	
Calhoun Falls				3.04	
Camden				5.43	
Cheraw a	96	59	77.2	3.34	
Cheraw b				4.97	
Clemson College	99	58	77.3	3.17	
Conway	98	59	79.4	8.25	
Darlington	101	58	79.2	6.53	
Duewest	98	62	78.6	3.05	
Edisto				6.86	
Effingham				6.80	
Florence	100	61	79.4	4.22	
Gaffney	102	56	79.0	3.51	
Georgetown	97	62	79.8	4.55	
Gillisonville	98	60	79.7	5.03	
Greenville	94	58	74.3	4.49	
Greenwood	97	60	78.4	3.86	
Heath Springs	104	55	79.4	7.34	
Kingstree a	94	60	77.3	6.35	
Kingstree b				7.01	
Liberty	99	59	79.0	6.21	
Little Mountain	102	61	79.0	6.18	
Longshore	101	60	78.4	5.39	
Lugoff	101	59	78.9	5.68	
Pinopolis *1	92	66	79.4	2.59	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
South Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
St. Georges	98	62	78.8	4.88	
St. Matthews	96	63	78.6	6.54	
St. Stephens				5.85	
Saluda	101	58	79.0	4.80	
Santuck	101	58	77.8	4.33	
Seivern	100	56	78.5	5.51	
Smiths Mills				6.92	
Society Hill	96	61	78.4	4.87	
Spartanburg	99	59	77.4	1.20	
Statesburg	97	62	78.4	7.45	
Summerville	97	60	78.2	6.82	
Temperance	103*	56*	79.4*	3.85	
Trenton	98*	60	78.6	5.08	
Trial	99	56	77.8	5.30	
Walhalla	98	57	75.6	3.35	
Winnsboro	102	62	78.7	5.54	
Winthrop College	98	59	77.3	7.11	
Yemassee	99	63	80.4	7.49	
Yorkville	100	62	79.1	2.69	
South Dakota.					
Aberdeen	91	34	67.6	1.51	
Academy	99	40	69.2	5.34	
Alexandria	97	32	67.5	4.36	
Armour	98	36	69.7	4.01	
Ashcroft	94	33	68.0	1.26	
Bowdle	101	32	66.6	3.58	
Brookings	87	33	65.1	5.30	
Canton	90	33	68.4	6.07	
Centerville				3.00	
Chamberlain	99	41	71.0	4.63	
Clark	91	32	67.7	3.13	
Desmet	92	38	65.8	4.93	
Elkpoint	100	40	70.8	4.22	
Farmingdale				1.08	
Faulkton	94	35	66.9	3.58	
Flandreau	88	33	65.9	9.84	
Forestburg	96	33	68.2	5.00	
Fort Meade	98	45	72.4	0.07	
Gannvalley	100	36	70.4	3.91	
Gettysburg				3.90	
Grand River School	96	35	68.9	3.18	
Greenwood	96	40	71.8	5.96	
Highmore				3.20	
Hitchcock				1.69	
Hotch City	96	36	69.6	3.59	
Howard	88	26	64.0	6.51	
Howell	95	35	67.8	2.48	
Ipswich	95	30	67.2	2.85	
Kimball	96	47	68.3	3.77	
Leola	97	32	66.2	3.14	
Marion	94	35	67.0	2.66	
Mellette	93	33	67.1	3.98	
Menno	93	36	68.9	3.62	
Millbank	96	37	66.8	2.70	
Mitchell	95	37	68.0	4.35	
Oelrichs	99	34	70.4	1.30	
Pedro	95	34	71.2	6.68	
Plankinton	93*	39	69.7*	3.70	
Ramsey	89	28	67.2	6.45	
Redfield	92	32	66.8	2.64	
Rosebud	96	39	71.4	3.08	
St. Lawrence	99	35	67.2	3.16	
Silver City				1.19	
Sioux Falls	90	35	67.4	4.85	
Sisseton Agency	89	40	65.8	2.88	
Spearfish	88	40	66.8	1.44	
Tyndall	93	36	69.3	4.32	
Vermillion	96	42	70.6	4.01	
Watertown	88	32	65.8	3.34	
Waubay	90	32	64.0	2.91	
Wentworth	94	37	67.7	6.47	
Wessington Springs	93	43	69.4	2.02	
Wolsey				2.30	
Tennessee.					
Andersonville	97	51	75.3	2.17	
Arlington	98	56	79.0	9.36	
Ashwood	98¹	51¹	78.1¹	2.85	
Bluff City				2.70	
Bolivar	97	56	78.1	5.02	
Bristol	90	50	70.8	3.55	
Brownsville	94	58	78.4	4.61	
Byrdstown	94	53	74.9	4.22	
Carthage	101	57	79.7	4.53	
Clarksville	96	56	78.2	2.50	
Clinton				1.10	
Covington	95	58	78.5	6.68	
Decatur	101	54	77.6	1.32	
Dickson	99	55	76.8	5.25	
Dyersburg	97	65	80.0	4.92	
Elizabethton	92	52	72.8	3.06	
Erasmus	98	42	71.2	3.09	
Florence	97	57	77.3	2.14	
Franklin	97	58	78.5	2.10	
Grace *¹	98	69	79.2	6.90	
Greeneville	94	50	73.7	2.98	
Harriman	98	53	76.5	2.11	
Hohenwald	100	49	75.8	3.82	
Iron City	99	52	77.8	3.78	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Tennessee—Cont'd.	°	°	°	*Ins.*	*Ins.*
Isabella	94	57	76.0	3.68	
Johnsonville	99	52	77.9	2.34	
Jonesboro *¹	89	65	74.5	2.91	
Kenton *⁵	100	55	78.0	4.76	
Kingston				2.18	
Lafayette *⁵	97	54	75.6	2.35	
Leadvale				0.04	
Lewisburg	100	54	78.6	6.21	
Liberty	96	51	75.6	2.93	
Lynnville	96	56	76.4	5.40	
McKenzie	101	60	79.4	3.73	
McMinnville	98	52	76.2	1.89	
Maryville	100	56	78.2	1.99	
Milan	100	56	78.6	4.98	
Newport	95	54	76.4	1.60	
Nunnelly	98	50	76.8	4.92	
Oakhill	92	50	73.4	2.60	
Palmetto	99	55	78.3	4.01	
Pope	100	51	78.2	4.83	
Rogersville	95f	53	74.9*	2.85	
Rugby	94	45	73.2	2.92	
Savannah	99	58	79.2	5.40	
Sewanee	96	60	76.2	2.17	
Silverlake	82	48	67.2	6.35	
Springdale	96	54	76.0	1.65	
Springfield	104	50	78.4	1.00	
Tazewell				2.32	
Tellico Plains	98	56	76.7	3.04	
Tracy City	95	53	74.4	3.80	
Tullahoma	98	55	75.9	2.45	
Waynesboro	99	51¹	77.7f	3.00	
Wildersville	92	58	76.4	8.25	
Texas.					
Albany	98	68	85.0	0.50	
Alvin				0.20	
Anna	106	67	85.5	1.76	
Anson				T.	
Arthur				0.90	
Austin a	100	70	86.6	0.00	
Austin b *⁵	98	70	83.8		
Ballinger	102	70	85.0	0.62	
Bastrop	106	72	87.7	0.00	
Beaumont	104	73	86.6	0.09	
Beeville	104	71	87.5	0.00	
Bigspring	103	64	85.2	1.24	
Blanco	99	67	83.2	0.12	
Boerne *¹	105	69	85.4	0.06	
Booth				0.58	
Bowie	106	66	87.4	0.52	
Brazoria	95	71	82.6	0.65	
Brenham	100	73	84.8	0.00	
Brighton	94	72	84.4	0.00	
Brownwood	105	70	87.6	T.	
Burnet	103	68	84.8	0.00	
Camp Eagle Pass	105	75	89.2	0.00	
Childress	105	64	85.4	0.80	
Coleman	99	69	84.1	0.12	
College Station	104	70	87.2	0.00	
Colorado	103	64	83.6	0.07	
Columbia	95	71	83.4	0.31	
Comanche	106	65	88.0	T.	
Corsicana	100	70	85.4	0.00	
Cotulla	110	71	89.2	0.00	
Cuero	104	74	88.1	0.01	
Dallas	107	70	85.0	0.64	
Danevang	103	70	85.4	0.00	
Dublin	100	70	84.1	0.00	
Duval	101	71	83.8	0.11	
Estelle	105	70	86.0	0.37	
Fort Brown	100	72	85.8	0.00	
Fort Clark	101	67	84.3	0.00	
Fort Davis	92	58	74.2	2.87	
Fort Ringgold	106	75	89.2	0.00	
Fort Stockton				0.74	
Fredericksburg	101f	69f	84.5f	0.00	
Gainesville	108d	68d	86.8*	0.07	
Georgetown	105	70	84.6	0.00	
Grapevine	105*	63*	85.4*	0.15	
Greenville	104	69	84.4	0.41	
Hale Center	95	60	77.8	T.	
Hallettsville	102	72	86.7	0.00	
Haskell	108	66	86.6	0.80	
Hearne	100	69	84.0	0.00	
Henrietta	107	66	88.0	0.67	
Hondo				0.00	
Houston	102	74	86.8	0.37	
Huntsville	97	72	84.6	0.33	
Ira	101	65	82.0	T.	
Jacksonville	98	70	83.6	0.00	
Jasper	100	70	84.0	0.83	
Kaufman	109	72	88.5	T.	
Kent				3.70	
Kerrville	99	66	82.2	0.42	
Kopperl				0.00	
Lampasas	104	70	85.0	0.00	
Lapara				0.00	
Llano *¹	105	74	87.9	0.00	
Longview	101	71	86.0	0.09	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Texas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Luling	101	72	86.2	0.00	
Mann	103	68	84.4	0.00	
Menardville	106	63	85.0	0.00	
Mount Blanco	99	61	80.2	0.02	
Nacogdoches	98	69	83.2	0.48	
New Braunfels	100	71	85.2	0.00	
Panter				0.09	
Paris a	105	69	84.7	0.10	
Pearsall	103	74	87.7	0.00	
Port Lavaca	97	75	85.3	0.00	
Rhineland	103	66	86.2	2.26	
Rockisland	100	70	83.4	T.	
Rockport	90	75	82.4	0.00	
Runge	104	72	89.7	0.00	
Sabine	96	73	84.0	T.	
Sanderson	98	72	83.4	0.55	
San Marcos	100	69	84.6	0.00	
San Saba	104	69	85.6	0.00	
Shaeffer Ranch	104	69	87.8	0.08	
Sherman	100	70	85.1	1.03	
Sugarland	99	69	84.0	0.00	
Sulphur Springs	101	72	84.6	0.06	
Temple a	100	68	83.8	0.00	
Temple b	99	71	83.6	0.00	
Trinity	103	72	85.4	0.02	
Tulia				1.00	
Tyler	102	72	86.4	0.10	
Victoria	104	72	86.4	0.00	
Waco	103	73	87.6	0.00	
Waxahachie	105	69	85.2	0.00	
Weatherford	102	71	86.7	0.22	
Weimar	106	73	88.5	0.00	
Wharton	99	73	85.2	0.50	
Utah.					
Aneth	106	49	77.0	1.22	
Blackrock	93	38	67.5	0.19	
Bluecreek *¹	98	68	77.8	0.05	
Castledale	103	39	69.6	0.23	
Cisco	100	52	75.0	1.25	
Corinne	102	37	72.6	0.36	
Coyoto	92	28	60.4	0.48	
Deseret	100	30	70.6	0.04	
Emery	91	40	61.6	0.45	
Farmington	96	43	70.4	0.34	
Fillmore	105	44	75.9	0.16	
Fort Duchesne	95	38b	69.4⁴		
Frisco	97	50	71.2	0.82	
Giles	105	44	73.2	0.40	
Government Creek	102	41	72.1	0.08	
Green River	110	46	79.6	0.62	
Grover	97	50	75.0	0.66	
Heber	96	28	63.4	0.50	
Henefer	95	28	62.2	0.12	
Hite	110	56	81.2	0.87	
Huntsville				0.29	
Kelton	101	38	69.3	T.	
La Sal	93	43	66.2	0.09	
Levan	96	41	70.0	0.20	
Loa	92	23	58.2	0.78	
Logan	94	45	70.5	0.27	
Manti	97	37	68.2	T.	
Marysvale	95	36	65.8	1.20	
Meadowville	93	37	63.9	0.30	
Millville				0.32	
Minersville	100	43	71.6	0.48	
Moab	105	49	75.6	0.53	
Monticello	98	46	68.5	1.72	
Mount Nebo	102	42	74.3	0.28	
Ogden	93	48	71.2	0.34	
Parowan	100	41	69.2	0.76	
Pinto	92	31	63.4	1.71	
Plateau	94	27	63.0	0.52	
Provo	102	39	70.6	0.20	
Ranch	89	32	61.3	2.25	
Richfield	94	35	66.2	0.22	
St. George	109	43	76.4	1.23	
Scipio	100	29	69.1	0.21	
Snowville	96	50	64.7	0.00	
Terrace	98	41	69.4	T.	
Thistle	103	39	67.0	0.20	
Tooele	98	50	73.4	0.14	
Tropic	99	23	60.4	1.31	
Vernal	98	40	70.2	0.46	
Virgin	102	58	77.9		
Wellington	101	35	69.0	0.24	
Woodruff	93	25	59.2	0.29	
Vermont.					
Burlington	82	50	66.4	3.17	
Chelsea	82	41	61.0	2.92	
Cornwall	86	46	65.4	4.62	
Enosburg Falls	86	37	62.8	2.85	
Hartland	82	39	62.6	4.28	
Jacksonville	84	38	61.4	2.65	
Manchester	83	41	62.8	5.92	
Newport	86	38	62.4		
St. Johnsbury	86	40	63.0	6.44	
Vernon *⁶	84	54	66.8	3.06	
Wells	80	42	63.4	3.00	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Vermont—Cont'd.					
Woodstock	84	38	62.8	3.89	
Virginia.					
Alexandria	91	51	73.4	1.92	
Ashland	96	54	73.4	2.61	
Bedford	96	53	76.0	2.34	
Rigstone Gap	92	47	72.6	2.69	
Birdsnest²			72.2	3.65	
Blacksburg	89	47	71.3	1.06	
Bonair	96	55	74.1	3.94	
Buckingham	72	41	57.7	4.39	
Burkes Garden	83	38	64.8	2.47	
Callaville	93	54	74.6	4.07	
Charlottesville	92	54	72.9	3.45	
Clarksville				2.70	
Cliftonforge	107	62	84.2	2.05	
Columbia	95	52	74.0	4.00	
Dale Enterprise	94	46	70.3	3.54	
Danville				1.53	
Farmville	98	50	75.1	2.60	
Fredericksburg	93	52	74.0	1.68	
Freeling	92	48	73.2	2.05	
Grahams Forge	90°	45°	71.2°	2.26	
Hampton	94	60	76.2	2.70	
Hot Springs	86	44	67.4	2.27	
Lexington	92	48	71.9	1.29	
Lincoln	98	40	72.8	1.57	
Manassas	90	48	72.6	1.09	
Marion	91ᵈ	47ᵈ	70.0ᵈ	3.55	
Mendota				3.14	
Newport News	100	58	78.6	3.25	
Petersburg	97	54	74.0	4.42	
Quantico	94	49	74.0		
Richmond (near)				0.46	
Riverton				1.90	
Rockymount	87	53	70.6	1.61	
Shenandoah				2.53	
Speers Ferry				3.80	
Spottaville	96	50	74.4	4.95	
Stanardsville	94	40	67.8	3.70	
Staunton	91	48	71.8	0.80	
Warsaw	92	54	73.8	2.75	
Wilkersons	93	56	74.2	1.78	
Williamsburg	92	55	71.8	3.18	
Woodstock	96	45	71.6	3.26	
Wytheville	92	46	72.0	1.14	
Washington.					
Aberdeen	90	40	59.6	0.42	
Anacortes				1.15	
Ashford				1.27	
Bremerton	95	41	63.7	0.37	
Brinnon	89	46	63.8	0.56	
Cedonia	88	35	63.0	0.47	
Centralia	98	35	62.4	0.90	
Cheney				0.40	
Clearwater	86	42	60.0	1.71	
Cle Elum	98	35	63.9	0.09	
Colfax	95	29	62.4	0.33	
Colville	95	29	61.5	0.41	
Conconully	92	36	63.9	0.54	
Connell				T.	
Coupeville	83	46	61.1	0.60	
Crescent	95	34	64.2	0.22	
East Sound	84	36	60.2	1.13	
Ellensburg	92	39	64.9	6.00	
Grandmound	92	37	62.2	0.75	
Granite Falls				2.25	
Hooper	102	36	70.2	0.14	
Ilwaco	82	45	59.9	1.13	
Lacenter	100	40	64.3	0.87	
Lakeside	98	50	73.3	0.15	
Lind	101	38	72.2	0.23	
Loomis	97	44	70.4	0.60	
Mayfield	99°	40°	64.6°	1.41	
Mottinger Ranch	104	46	74.4	0.02	
Mount Pleasant	101	42	65.2	1.21	
Moxee Valley	100	41	68.2	T.	
Olga f	83	47	60.4	0.96	
Olympia	95	40	62.9	0.24	
Pinehill	103	42	69.4	T.	
Pomeroy	102	36	69.6	0.23	
Port Townsend	85	46	60.9	0.94	
Pullman	93	34	64.9	0.07	
Rattlesnake Mountains	95	41	69.2	T.	
Republic	97	30	62.2	0.43	
Ritzville (near)				0.10	
Rosalia	94	33	62.8	0.41	
Sedro				2.27	
Silvana	86°	36°	61.6°	1.46	
Snohomish	89	39	61.0	0.81	
Snoqualmie	93	40	63.6	0.97	
Southbend	98	40	61.7	0.55	
Sprague				0.20	
Stampede				1.10	
Sunnyside	97	41	68.6	0.00	
Union	92	40	63.7	0.45	
Usk	93	30	60.8	0.57	
Vancouver	96	42	63.8	0.31	
Vashon	84	45	62.2	0.31	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Washington—Cont'd.					
Waterville	103	38	66.8	0.17	
Wenatchee (near)	96	42	68.4	0.08	
Whatcom	94	39	60.4	1.81	
Wilbur	94	27	62.6	0.28	
Zindel	103	48	77.0	1.05	
West Virginia.					
Addison	91ᵈ	46ᵈ	71.7ᵈ	1.80	
Bayard	86	36	64.3	2.00	
Beverly	90	42	68.0	2.89	
Buckhannon	91	42	68.6	3.55	
Burlington	92	45	70.3	3.02	
Byrne	93	49	72.7	1.70	
Cairo	95	40	71.3	1.09	
Camden	86	50	72.0	2.43	
Central	91	43	68.8	2.36	
Chapel	93	54	76.0	1.15	
Charleston				1.48	
Creston	97	46	71.0	1.12	
Cuba	91	46	71.0	0.97	
Dayton	92	41	66.9	2.01	
Echo	98	49	74.8	1.21	
Elkhorn	89	46	70.5	3.63	
Fairmont				2.09	
Glenville	90	49	71.0	3.86	
Grafton	90	42	69.0	4.80	
Green Sulphur	88	43	69.2	1.15	
Harpers Ferry				0.60	
Hinton b	92°	49°	71.8°	1.93	
Huntington	94	50	73.4	1.59	
Josiah	93	48	71.2	3.80	
Leonard	84	48	67.4	6.05	
Lewisburg	88	44	69.0	1.68	
Logan	96	47	72.8	2.91	
Magnolia	95	44	70.6	2.69	
Martinsburg	92	47	70.6	2.16	
Morgantown	88	45	69.0	4.87	
Moscow	87	45	67.2	3.25	
Moundsville	90	44	70.2	2.33	
New Martinsville	98	49	73.0	2.64	
Nuttallburg	93	48	72.0	2.23	
Oldfields				1.72	
Parsons	91	44	67.6	1.30	
Philippi	88	40	68.6	2.71	
Pickens	87	42	66.8	1.71	
Point Pleasant	94	50	72.9	1.55	
Powellton	94	49	73.0	1.63	
Princeton	86	48	69.1	2.60	
Rippon	94	46	71.6	1.48	
Romney	96	42	70.4	2.51	
Rowlesburg				2.53	
Southside	93	54	73.7	1.58	
Terra Alta	85	39	64.3	4.10	
Uppertract	91	42	69.6	2.87	
Wellsburg	85	45	67.2	2.37	
Weston a				2.69	
Weston b	93	47	72.5		
Wheeling a				3.77	
Wheeling b	93	51	73.5	3.56	
Williamson	94	50	73.9	1.84	
Wisconsin.					
Appleton	82	46	64.8	1.99	
Ashland				1.99	
Barron	86	36	62.4	1.09	
Brodhead	88	43	67.7	0.64	
Butternut	87	30	59.4	1.74	
Chilton	86	44	64.3	1.26	
Darlington	87	39	64.6	1.10	
Delvan	87	45	66.5	0.57	
Dodgeville	87	47	67.6	0.70	
Easton	87	39	66.2	1.13	
Eau Claire	88	45	67.0	3.25	
Florence	84	34	62.6	2.18	
Fond du Lac	84	45	65.2	0.95	
Grand River Locks				0.95	
Grantsburg	89	40	63.8	1.36	
Harvey	84	46	66.0	0.90	
Hayward	87	37	62.8	1.96	
Hillsboro	86	39	64.6	0.72	
Koepenick	92	32	63.0	0.80	
Ladysmith	86	40	62.8	3.03	
Lancaster	86	45	67.0	0.48	
Madison	84	52	67.4	0.78	
Manitowoc	84	46	64.5	1.69	
Meadow Valley	89	35	65.7	2.39	
Medford	99	40	67.6	5.20	
Menasha				0.93	
Neillsville	90	38	67.4	3.12	
New London	85	41	65.4	1.62	
North Crandon	83ᵈ	32ᵈ	61.1ᵈ	1.94	
Oconto	87	41	65.2	1.41	
Osceola	88	40	64.4	3.60	
Oshkosh	84	43	66.0	1.46	
Pepin	88	50	69.2	6.96	
Pine River	85	42	65.4	0.97	
Portage	84	45	67.0	1.06	
Port Washington	87	43	64.4	0.50	
Prairie du Chien a	91	45	69.0	1.65	
Prairie du Chien b				1.43	

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Wisconsin—Cont'd.					
Prentice	86	33	62.0	2.85	
Racine	89	49	68.2	0.45	
Sheboygan	84	49	65.8	0.80	
Spooner	86	40	63.4	2.50	
Stevens Point	87	38	66.2	1.82	
Valley Junction	91	39	66.6	3.24	
Viroqua	85	43	65.2	1.39	
Watertown	84	42	65.7	0.76	
Waukesha	83	51	66.0	0.64	
Waupaca	85	40	65.6	1.48	
Westfield	85	42	66.4	0.38	
Whitehall	92	40	66.0	7.18	
Wyoming.					
Alcova	99	42	71.4	0.23	
Basin	99	42	72.8	0.04	
Bedford	92	28	58.8	0.34	
Border	90	29	60.3	0.31	
Buffalo	90	37	66.0	T.	
Centennial	85	32	58.4	0.11	
Chugwater	92°	36°	65.4°	0.44	
Daniel	85	26	54.8	0.64	
Evanston	89	29	59.2	0.21	
Fort Laramie	102	40	72.2	T.	
Fort Washakie	95	38	67.4	0.01	
Fort Yellowstone	85	30	59.3	0.61	
Fourbear	83	29	58.8	0.01	
Griggs	99	35	66.8	0.15	
Hyattville	98	33	69.0	0.00	
Irma				0.14	
Iron Mountain	94	32	66.0	0.19	
Laramie	91	36	62.2	0.40	
Leo	92	29	62.0	T.	
Lusk	93	32	66.9	0.45	
Moore	96	31	65.4	T.	
Parkman	92	31	65.0	0.27	
Pinebluff	98	44	70.0	0.50	
Rawlins	98	34	65.6	0.10	
Red Bank	95	34	67.2	T.	
Rocksprings	97	36	65.6	0.17	
Saratoga	94	33	64.6	0.29	
South Pass City	86	25	58.0		
Thayne	88	26	58.2	0.50	
Thermopolis	103	41	70.4	0.00	
Porto Rico.					
Adjuntas	90	58	73.3	7.23	
Aguadilla	94	69	81.6	9.20	
Aguirre	91	67	80.2	2.88	
Arecibo	94	65	78.6	7.54	
Barros	88	63	75.8	2.41	
Bayamon	97	68	81.6	8.17	
Caguas	92	61	78.2	3.74	
Canovanas	93	73	82.2	3.34	
Cayey	98	61	81.4	3.02	
Cidra	95	55	76.8	3.52	
Coamo	96	60	81.6	4.70	
Experimental Station				3.61	
Fajardo	95	68	83.0	3.24	
Guanica	94	64	79.7	2.88	
Guayama				4.12	
Hacienda Amistad	94	61	78.5	2.40	
Hacienda Coloso	93	64	78.8	6.04	
Hacienda Perla	90	74	81.2	7.17	
Humacao	90	78	84.4	7.75	
Isabela	90	70	80.5	5.10	
La Isolina	91	65	78.2	4.01	
Las Marias	92	60	78.6	9.63	
Manati	97	68	80.8	3.67	
Maunabo	96	73	84.5	2.94	
Mayaguez	96	65	80.8	5.80	
Morovis	97	66	80.4	9.65	
Ponce	94	69	80.7	2.98	
San German	95	69	82.0	9.54	
San Lorenzo	93	66	79.6	5.75	
San Salvador	89	63	76.2	5.07	
Santa Isabel	91	70	80.8	2.72	
Utuado	96	63	80.6	4.11	
Vieques	91	72	80.5	1.72	
Yauco	89	68	79.6	2.98	
Mexico.					
Ciudad P. Diaz	101	78	88.7	0.00	
Coatzacoalcos	91	70	80.4	13.48	
Leon de Aldamas	85	53	70.2	1.74	
Vera Cruz	95	71	81.9	2.24	
New Brunswick.					
St. John	76	50	62.0	3.42	
Nicaragua.					
Nandaime	90	74	82.3	0.64	
Isthmus of Panama.					
Alhajuela	92	73	80.6	9.45	
La Boca	87	72	79.2		

Late reports for July, 1902.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
California.					
Kernville				0.00	
Mokelumne Hill		50	69.1	0.00	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.		°	°	°	Ins.	Ins.
Colorado.						*Ohio—Cont'd.*					
Wray	101	47	72.1	3.33		North Lewisburg	92	48	74.0	2.45	
Delaware.						Wadsworth				7.35	
Newark				5.08		Williamstown				6.74	
Georgia.						Willoughby				5.38	
Brent	106	62	82.7	3.83		*Oregon.*					
Iowa.						Aurora (near)	92	42	62.4	2.09	
Olin	90	49	72.6	8.47		Kirby	104	35	65.0	0.12	
Kansas.						*Pennsylvania.*					
Newton	100	60	78.0	1.69		Shawmont				4.52	
Michigan.						*Rhode Island.*					
Plymouth				5.10		Pawtucket	91	51	70.6	4.08	
Missouri.						*South Dakota.*					
Sarcoxie				3.78		Doland	98	45	70.9	4.81	
Montana.						Leslie	110	45	72.8	0.05	
Missoula	97	36	65.4	......		*Texas.*					
Nebraska.						Austin b *5	97	67		8.10	......
St. Paul	93	48	72.6	5.54		Elmdale Ranch	99	69	83.2	5.06	
New York.						Tulia				2.20	
Boyds Corners				3.81		*Virginia.*					
Brockport	92	52	70.6	4.93		Charlottesville	97	58	77.2	4.82	
Southeast Reservoir				4.74		*Washington.*					
North Carolina.						Lyle	101	42	67.0	0.30	
Biltmore	87	56	71.6	0.94		Usk	90	39	60.3	3.21	
Statesville	96	55	77.6	1.83		*Wisconsin.*					
Washington	105	67	84.0	2.55		Downing				3.73	
North Dakota.						*Wyoming.*					
Berwick	95	36	66.2	1.55		Daniel	82	26	53.2	0.56	
Ohio.						Kemmerer	95*	26*	60.0*	0.40	
Bement	92	47	71.2	5.23		Lagrange	97	40	66.6	3.46	
Centerburg				4.53		Lolabama Ranch	86	27	54.2	0.94	
Circleville	95	53	74.8	1.60		*Porto Rico.*					
Coolville				3.69		San Lorenzo	92	65	78.8	4.74	
Coshocton				3.76		*Mexico.*					
Dunkirk				5.84		Cuidad P. Diaz	101	71	84.9	1.89	
Fort Recovery				1.97		Leon de Aldamas	86	55	69.0	8.19	
Galigher				8.73		*Nicaragua.*					
Hedges	95	48	73.8	3.02		Nandaime	89	74	80.7	3.43	
Manara	95	50	74.5	2.11							

EXPLANATION OF SIGNS.

*Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston a," "Livingston b," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance "n" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

July, 1902, California, Lodi, make mean temperature read 73.0° instead of 72.8°. Page 375, make sea level pressure at Denver, Colo., read 29.91 instead of 29.99.

June, 1902, North Carolina, Horse Cove, the values printed are those for May, 1902, instead of June, 1902.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of August, 1902.*

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
	Hours.	Hours.	Hours.	Hours.	°	Hours.
New England.						
Eastport, Me	17	18	12	27	s. 86 w.	15
Portland, Me	18	19	8	28	s. 87 w.	20
Northfield, Vt	20	31	8	9	s.	11
Boston, Mass	18	16	10	30	n. 84 w.	20
Nantucket, Mass	17	24	14	24	s. 55 w.	12
Block Island, R. I	13	20	16	·29	s. 62 w.	15
New Haven, Conn	25	19	8	21	n. 65 w.	14
Middle Atlantic States.						
Albany, N. Y	19	25	11	19	s. 53 w.	10
Binghamton, N. Y.†	12	5	12	12	n.	7
New York, N. Y	21	17	12	29	n. 77 w.	18
Harrisburg, Pa.†	12	4	8	10	n. 14 w.	8
Philadelphia, Pa	18	21	8	22	s. 78 w.	14
Scranton, Pa	28	17	15	29	n. 52 w.	18
Atlantic City, N. J	19	22	10	26	s. 79 w.	16
Cape May, N. J	20	25	11	16	s. 45 w.	7
Baltimore, Md	23	22	12	19	n. 82 w.	7
Washington, D. C	19	21	16	16	s.	2
Lynchburg, Va	10	22	30	12	s. 56 e.	22
Norfolk, Va	17	28	18	11	s. 32 e.	13
Richmond, Va	25	22	20	9	n. 75 e.	11
South Atlantic States.						
Charlotte, N. C	11	27	18	19	s. 3 e.	16
Hatteras, N. C	23	17	19	21	n. 18 w.	6
Kitty Hawk, N. C.†	10	11	9	10	s. 45 w.	1
Raleigh, N. C	17	22	17	19	s. 22 w.	5
Wilmington, N. C	17	20	21	19	s. 34 e.	4
Charleston, S. C	16	21	16	22	s. 50 w.	8
Columbia, S. C	15	24	28	12	s. 58 e.	19
Augusta, Ga	16	26	23	13	s. 45 e.	14
Savannah, Ga	15	19	20	23	s. 37 w.	5
Jacksonville, Fla	19	23	15	22	s. 60 w.	8
Florida Peninsula.						
Jupiter, Fla	13	15	21	24	s. 56 w.	4
Key West, Fla	10	16	38	11	s. 78 w.	28
Tampa, Fla	17	19	26	14	s. 81 e.	12
Eastern Gulf States.						
Atlanta, Ga	15	26	15	18	s. 15 w.	11
Macon, Ga.†	3	12	7	11	s. 24 w.	10
Pensacola, Fla.†	10	6	4	18	n. 74 w.	15
Mobile, Ala	12	23	9	30	s. 62 w.	24
Montgomery, Ala	10	31	13	21	s. 21 w.	22
Meridian, Miss†	6	12	6	13	s. 49 w.	9
Vicksburg, Miss	17	23	12	25	s. 65 w.	14
New Orleans, La	5	24	8	39	s. 59 w.	36
Western Gulf States.						
Shreveport, La	7	28	20	20	s.	21
Fort Smith, Ark	10	17	39	2	s. 80 e.	38
Little Rock, Ark	20	23	14	22	s. 69 w.	8
Corpus Christi, Tex	0	45	37	0	s. 39 e.	58
Fort Worth, Tex	1	48	14	9	s. 6 e.	48
Galveston, Tex	0	51	7	13	s. 7 w.	50
Palestine, Tex	0	50	5	22	s. 19 w.	53
San Antonio, Tex	0	39	44	0	s. 48 e.	59
Taylor, Tex †	0	30	1	4	s. 6 w.	30
Ohio Valley and Tennessee.						
Chattanooga, Tenn	22	16	13	22	n. 56 w.	11
Knoxville, Tenn	27	19	13	20	n. 41 w.	11
Memphis, Tenn	22	21	17	19	n. 63 w.	2
Nashville, Tenn	17	18	9	26	s. 87 w.	17
Lexington, Ky. †	6	11	12	9	s. 31 e.	6
Louisville, Ky	29	18	10	19	n. 39 w.	14
Evansville, Ind.†	14	7	15	3	n. 60 e.	14
Indianapolis, Ind	30	16	14	16	n. 8 w.	14
Cincinnati, Ohio	24	11	25	18	n. 28 e.	15
Columbus, Ohio	28	13	22	13	n. 31 e.	18
Pittsburg, Pa	29	13	17	20	n. 11 w.	16
Parkersburg, W. Va	25	17	17	12	n. 32 e.	9
Elkins, W. Va	24	19	7	23	n. 73 w.	17
Lower Lake Region.						
Buffalo, N. Y	20	16	15	25	n. 68 w.	11
Oswego, N. Y	16	25	15	19	s. 24 w.	10
Rochester, N. Y	16	16	11	34	w.	23
Erie, Pa	23	16	12	23	n. 58 w.	13
Cleveland, Ohio	27	18	15	15	n.	9
Sandusky, Ohio†	13	10	8	6	n. 34 e.	4
Toledo, Ohio	22	11	21	19	n. 10 e.	11
Detroit, Mich	29	12	23	14	n. 28 e.	19
Upper Lake Region.						
Alpena, Mich	24	19	18	22	n. 39 w.	6
Escanaba, Mich	27	23	7	17	n. 68 w.	11
Grand Haven, Mich	27	14	13	16	n. 13 w.	13
Houghton, Mich.†	7	3	12	14	n. 27 w.	4
Marquette, Mich	26	17	11	23	n. 53 w.	15
Port Huron, Mich	31	14	17	15	n. 7 e.	17
Sault Ste. Marie, Mich	20	13	18	26	n. 49 w.	11
Chicago, Ill	21	22	24	9	s. 86 e.	15
Milwaukee, Wis	24	15	22	16	n. 34 e.	11
Green Bay, Wis	14	25	20	17	s. 15 e.	11
Duluth, Minn	36	5	27	15	n. 21 e.	33
North Dakota.						
Moorhead, Minn	20	23	23	17	s. 63 e.	7
Bismarck, N. Dak	23	21	20	8	n. 81 e.	12
Williston, N. Dak	23	23	12	13	w.	1

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
	Hours.	Hours.	Hours.	Hours.	°	Hours.
Upper Mississippi Valley.						
St. Paul, Minn	18	37	20	10	s. 28 e.	22
La Crosse, Wis. †	12	12	5	8	w.	3
Davenport, Iowa	21	11	31	17	n. 54 e.	17
Des Moines, Iowa	16	20	30	14	s. 76 e.	16
Dubuque, Iowa	25	19	19	20	n. 9 w.	6
Keokuk, Iowa	21	13	28	16	n. 56 e.	14
Cairo, Ill	22	24	21	8	s. 81 e.	13
Springfield, Ill	13	15	29	16	s. 81 e.	13
Hannibal, Mo. †	8	9	13	7	s. 80 e.	6
St. Louis, Mo	22	19	20	11	n. 72 e.	10
Missouri Valley.						
Columbia, Mo. *	8	11	12	7	s. 59 e.	6
Kansas City, Mo	16	26	28	7	s. 65 e.	23
Springfield, Mo	13	30	23	13	s. 30 e.	20
Lincoln, Nebr	20	20	29	8	w.	21
Omaha, Nebr	20	24	25	8	s. 77 e.	18
Valentine, Nebr	12	18	28	13	s. 68 e.	15
Sioux City, Iowa †	10	10	15	6	e.	9
Pierre, S. Dak	16	22	27	9	s. 72 e.	19
Huron, S. Dak	16	26	22	13	s. 42 e.	13
Yankton, S. Dak. †	12	9	14	7	n. 67 e.	76
Northern Slope.						
Havre, Mont	12	16	12	36	s. 78 w.	24
Miles City, Mont	20	13	13	24	n. 58 w.	13
Helena, Mont	10	23	7	40	s. 69 w.	36
Kalispell, Mont	8	18	15	35	s. 63 w.	22
Rapid City, S. Dak	20	14	20	22	n. 18 w.	6
Cheyenne, Wyo	20	19	10	25	n. 86 w.	15
Lander, Wyo	18	26	10	25	s. 59 w.	18
North Platte, Nebr	14	21	29	11	s. 69 e.	19
Middle Slope.						
Denver, Colo	12	28	20	12	s. 27 e.	18
Pueblo, Colo	26	13	20	19	n. 4 e.	13
Concordia, Kans	12	30	25	4	s. 49 e.	28
Dodge, Kans	14	27	33	5	s. 65 e.	31
Wichita, Kans	13	32	23	5	s. 43 e.	26
Oklahoma, Okla	6	41	17	5	s. 19 e.	37
Southern Slope.						
Abilene, Texas	7	41	32	2	s. 48 e.	45
Amarillo, Tex	5	47	11	8	s. 4 e.	43
Southern Plateau.						
El Paso, Texas	23	12	31	14	n. 57 e.	20
Santa Fe, N. Mex	10	29	24	10	s. 36 e.	24
Flagstaff, Ariz	24	16	5	33	n. 74 w.	29
Phoenix, Ariz	11	17	23	21	s. 18 e.	6
Yuma, Ariz	8	27	16	24	s. 23 w.	21
Independence, Cal	16	26	15	22	s. 35 w.	12
Middle Plateau.						
Carson City, Nev	5	24	4	40	s. 62 w.	41
Winnemucca, Nev	29	13	18	19	n. 3 w.	16
Modena, Utah	9	25	6	37	s. 63 w.	35
Salt Lake City, Utah	24	15	22	14	n. 42 e.	12
Grand Junction, Colo	18	20	27	16	s. 80 e.	11
Northern Plateau.						
Baker City, Oreg	25	24	9	14	n. 79 w.	5
Boise, Idaho	12	19	13	32	s. 70 w.	20
Lewiston, Idaho †	1	3	27	2	s. 85 e.	25
Pocatello, Idaho	4	27	19	29	s. 23 w.	25
Spokane, Wash	11	25	20	19	s. 4 e.	14
Walla Walla, Wash	7	42	6	19	s. 22 w.	38
North Pacific Coast Region.						
Neah Bay, Wash	4	13	8	46	s. 77 w.	39
North Head, Wash	38	6	4	33	n. 42 w.	43
Port Crescent, Wash. *	1	1	4	26	w.	22
Seattle, Wash	31	12	19	18	n. 3 e.	19
Tacoma, Wash	34	11	5	21	n. 35 w.	28
Astoria, Oreg	24	14	4	40	n. 74 w.	37
Portland, Oreg	35	9	8	28	n. 38 w.	33
Roseburg, Oreg	37	4	14	12	n. 3 e.	33
Middle Pacific Coast Region.						
Eureka, Cal	22	16	8	30	n. 75 w.	23
Mount Tamalpais, Cal	19	14	2	43	n. 83 w.	41
Red Bluff, Cal	20	28	23	10	s. 58 e.	15
Sacramento, Cal	5	48	20	4	s. 21 e.	46
San Francisco, Cal	0	24	0	51	s. 65 w.	56
South Pacific Coast Region.						
Fresno, Cal	34	2	1	45	n. 54 w.	54
Los Angeles, Cal	3	14	9	42	s. 72 w.	35
San Diego, Cal	25	11	3	37	n. 68 w.	37
San Luis Obispo, Cal	12	11	2	40	n. 88 w.	38
West Indies.						
Basseterre St. Kitts, W. I	10	3	55	1	n. 83 e.	54
Bridgetown, Barbados	10	7	55	0	n. 87 e.	55
Cienfuegos, Cuba	23	3	47	1	n. 67 e.	50
Colon, Columbia, S. A	9	7	14	3	n. 80 e.	11
Grand Turk, Turks Island †	1	15	23	0	s. 59 e.	27
Havana, Cuba	11	10	47	4	n. 89 e.	43
Kingston, Jamaica	47	2	25	2	n. 27 e.	50
Port of Spain, Trinidad, W. I †	3	7	22	3	s. 78 e.	19
Puerto Principe, Cuba	16	13	40	6	n. 85 e.	34
Roseau, Dominica, W. I †	12	7	17	7	n. 63 e.	11
San Juan, Porto Rico	0	14	54	1	s. 75 e.	55
Santiago de Cuba, Cuba	41	12	13	7	n. 12 e.	30
Santo Domingo, S. Dom., W. I	45	9	15	1	n. 21 e.	39

* From observations at 8 p. m. only. † From observations at 8 a. m. only.

TABLE IV.—*Thunderstorms and auroras, August, 1902.*

States.	No. of stations		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	No.	Days	
Alabama	52	T.	4	4	2	4	6	5	1	1	2	5	3	4		1	5	2			1	2	2	2	2				2	5				65	22	T.
		A.																																0	0	A.
Arizona	56	T.	5	9	5	7	5	11	5	9	7	7	7	8	7		1	1			1	2	2	5	7	7	5	1	3		4			131	25	T.
		A.																																0	0	A.
Arkansas	57	T.			1	5		5	4	4	6			2	3	5	1		1	1	3	6	5	2		3	8			2	5			72	20	T.
		A.																																0	0	A.
California	167	T.	1			1	3	2	11	11	29	12	3	9	2	2	2			1	1					1		2					93	17	T.
		A.																																0	0	A.
Colorado	81	T.	1	12	12	11	16	1	17	4	4	1	8	4	9	3	2	9	5	1		8	13	8	15	8	11	12	15	18	14	9	3	254	30	T.
		A.																																0	0	A.
Connecticut	21	T.	1	1	9	2		14		7			16			6				10	1		5	1		5	2	1	3					84	16	T.
		A.																																0	0	A.
Delaware	5	T.	2		8	2	2	4			2	6							2			2												30	9	T.
		A.																																0	0	A.
Dist. of Columbia	4	T.	1		1	1		1				1	1				1							1	1									9	9	T.
		A.																																0	0	A.
Florida	47	T.	15	13	12	10	9	11	6	9	8	9	5	4	7	6	9	10	7	5	1	2	5	14	13	9	3	1		2	5	9	11	230	30	T.
		A.																																0	0	A.
Georgia	55	T.	5	9	9	11	7	3	2	2	2	14	12	1	6	4	19	17	1	2	8	3	6	4	6			2	1	1				157	26	T.
		A.																																0	0	A.
Idaho	34	T.						1				1	4	3	5	2	4				1		1	1	4	1								28	12	T.
		A.																																0	0	A.
Illinois	92	T.	2	1	12	26	26		2	4	18	23	1		12	1	19	1	22	25	18	27	2		1			6	1				5	255	23	T.
		A.																			1	1												2	2	A.
Indiana	58	T.	2	3	7	4	18	3	3	3	5	18		7		9		3	11	2	23	2										1	14	138	18	T.
		A.																											1				6	1	1	A.
Indian Territory	11	T.			2	1	2	6	3	4	1					3	1			1		2	1											33	13	T.
		A.																																0	0	A.
Iowa	149	T.		13	18	24	23	1		2	23	30		7	17	12	40	10	41	19	41	19	2	5		16	5	1		3	25	13		410	25	T.
		A.																																0	0	A.
Kansas	77	T.			1	2	4		2	25	11	27			3	6		2	15	15	32	29	26	25	15	7	16	15	2	22	29	18		349	24	T.
		A.																																0	0	A.
Kentucky	41	T.	4	1	1	6	9	3		1	2	7			18	1		8		11	4											1		77	15	T.
		A.																																0	0	A.
Louisiana	46	T.	4	7	9	7	6	16	13	9	5	4	6	10	5	7	1	2	6	7	3	1	1	2	4	1	2	2	7	7	2	7		166	31	T.
		A.																																0	0	A.
Maine	19	T.	4	4	3	8	1		5	2		5			4				1	5	2			1	2									47	14	T.
		A.																																0	0	A.
Maryland	48	T.	10	2	14	7	9	15	2		1	11	13	1					5	3	3		5	2		7	6							116	18	T.
		A.																																0	0	A.
Massachusetts	48	T.		1		17	1	6		16	2		20			1	2			5	6	7		13		4		1	3					105	16	T.
		A.																																0	0	A.
Michigan	106	T.		8	3		16	1	17		1	2				1		1	1	1	5	4		1	5	2	3						15	87	18	T.
		A.																																0	0	A.
Minnesota	67	T.	14	14		5	3	5	1	1	17	3			1		3	9	5	13	13		1			5	25	22	12					172	20	T.
		A.																																0	0	A.
Mississippi	44	T.	3	4	3	2	3	11	5	4		2	8	2	1	3	3	4		3	2	7	7	4	5		11	11	2	1	1	1		112	26	T.
		A.																																0	0	A.
Missouri	95	T.	2	1	25	13	38	3		10	9	44	2	2	2	8	33	7	20	44	13	25	6	29	10	7	21	45	33		2	14	32	500	29	T.
		A.																												1				1	1	A.
Montana	40	T.						12	6	4			3	1	9	6	5	4	1		1	2	1		6	6	7	6	1				1	82	19	T.
		A.																																0	0	A.
Nebraska	142	T.	3	12	17	19	7	3	1	25	15	15		2	2	25	12	18	17	17	7	22	14	23	5	10	13	7	1		10	33	5	360	29	T.
		A.																																0	0	A.
Nevada	40	T.		1	1	3	4	6	10	6	4	5	9	4	4	1			1		2	3			2									66	17	T.
		A.																																0	0	A.
New Hampshire	19	T.	2	5	2	2			2		9	1					7	9	7	2	7													55	12	T.
		A.																																0	0	A.
New Jersey	51	T.	7	6	21	12	2	26	2		1	23	23	2		5	1		16	3	10	3		8		2	11	5	1					190	22	T.
		A.																																0	0	A.
New Mexico	31	T.	2	2		1	7	3	4	2		2	2	1	2	1	1	4	1		1		7	6	5	6	2	3	2	2	3	2	1	75	27	T.
		A.																																0	0	A.
New York	99	T.	29	2	27	1	6	9	2			5	16			1	2	1		2	4	17	15	1	1	1		11	15					162	21	T.
		A.																																0	0	A.
North Carolina	56	T.	14	4	9	16	12	16		3	13	17	8	1	10	14	9	11		3	7	8	20	7	7									209	21	T.
		A.																																0	0	A.
North Dakota	48	T.	9			1			2	1				1	1		4	6		3	1	1		1	3	5	2							45	16	T.
		A.																																0	0	A.
Ohio	128	T.	6	26	16		12	9	13	2	9	15						12	38	13	1				3	3	9	8						195	17	T.
		A.									1								1															2	2	A.
Oklahoma	23	T.					5	2	7	4	2	2					3	1		1		1	1										5	34	12	T.
		A.																																0	0	A.
Oregon	74	T.							1		1	3	3	8	9	7	4		1	1	1		2	2	1									43	13	T.
		A.							1																									1	1	A.
Pennsylvania	91	T.	22	2	25	2	6	11	1	1	1	20	12		1	2		9	8	16	1		8		4	12								164	20	T.
		A.			1				1																									1	1	A.
Rhode Island	7	T.			1		1	2	4		4	2					4	3		2	3	1												27	11	T.
		A.			1																													0	0	A.
South Carolina	46	T.	15	7	4	11	9	13		5	10	12	13	5	9	21	17	16	3		6	3	14	12	11	1		1						221	24	T.
		A.																																0	0	A.
South Dakota	56	T.	6	3	7	4	1		9	7	2		1	11	5	11	10	5	14	6	11	11	4	2	4	1	2	7	15	10				169	26	T.
		A.																																0	0	A.
Tennessee	56	T.	4	5		13	8	14		2	14	6		10	11	9	1	12	7	10	14	8	1	1	1	2	1	1					1	155	23	T.
		A.																																0	0	A.
Texas	95	T.	2		1		2	4	3	3	1	3		2	1		2	4	1	2	2	1	2	2	5	5	5	3	4					60	23	T.
		A.																																0	0	A.
Utah	47	T.			4	5	2	1	2	3	5	2	16	16	10	1	1		7	3	4	4	14	5	8	5	1							119	22	T.
		A.																																0	0	A.
Vermont	16	T.	7	1	6	1				6		1		4	1		5	2	1	1	1													37	13	T.
		A.																																0	0	A.
Virginia	50	T.	10	2	9	12	6	18		4	6	9	1	3	5	3		2	10	6	1		1	3	8	1								121	22	T.
		A.																																0	0	A.
Washington	64	T.							1	1	3					1	1	1																7	5	T.
		A.																																0	0	A.
West Virginia	43	T.	11	12	10	4	6	11		7	14	1		1		2	15	16	1		1	2	2											116	17	T.
		A.			1																													1	1	A.
Wisconsin	60	T.		2	1	1	1		7		1	1		1		1	2	1	3	1		1		2	7	4								37	17	T.
		A.																																1	1	A.
Wyoming	31	T.	1	1			1	6	1		1	6	1	4	1	4	1		2	4	1		1	2	9	2	3	1						55	22	T.
		A.																																0	0	A.
Sums	2,893	T.	224	200	314	278	247	274	156	212	224	406	273	99	135	170	270	173	163	197	226	329	291	228	154	116	131	140	198	132	140	197	183	6,524		T.
		A.	0	0	2	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	1	0	0	9		A.

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during August, 1902, at all stations furnished with self-registering gages.*

Stations	Date	From—	To—	Total amount of precipitation	Began—	Ended—	Amount before excessive began	5 min	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45 min	50 min	60 min	80 min	100 min	120 min
Albany, N. Y.	21	2:42 p. m.	3:08 p. m.	0.60	2:42 p. m.	2:53 p. m.	0.00	0.36	0.57	0.59											
Alpena, Mich.	18	2:54 p. m.	11:09 p. m.	1.32	4:05 p. m.	4:25 p. m.	0.20	0.08	0.23	0.47	0.60	0.62	0.64								
Atlanta, Ga.	28-29			0.79														0.23			
Atlantic City, N. J.	3	1:35 p. m.	3:15 p. m.	1.07	1:45 p. m.	2:15 p. m.	0.05	0.28	0.57	0.80	0.86	0.94	0.99	1.01							
Do	4	2:55 p. m.	3:40 p. m.	1.13	2:55 p. m.	3:35 p. m.	0.00	0.12	0.34	0.53	0.75	0.97	1.01	1.06	1.13						
Augusta, Ga.	10	1:25 p. m.	6:40 p. m.	0.93	1:50 p. m.	2:03 p. m.	0.03	0.27	0.67	0.76	0.78										
Baltimore, Md.	5-6	11:40 p. m.	D. N.	1.43	11:46 p. m.	12:25 a. m.	0.01	0.10	0.30	0.49	0.56	0.64	0.89	1.24	1.40						
Do	27	4:29 p. m.	5:30 p. m.	1.27	4:37 p. m.	5:02 p. m.	T.	0.10	0.47	0.89	1.12	1.22	1.24	1.26							
Binghamton, N. Y	1	2:30 p. m.	5:10 p. m.	0.90	2:47 p. m.	3:07 p. m.	T.	0.10	0.25	0.48	0.63	0.64	0.69								
Bismarck, N. Dak.	30			0.54														0.32			
Boise, Idaho	12			0.20														0.13			
Boston, Mass.	11	1:00 p. m.	3:00 p. m.	0.85	1:14 p. m.	1:45 p. m.	T.	0.10	0.26	0.38	0.50	0.63	0.70	0.71							
Buffalo, N. Y.	5			0.44														0.35			
Cairo, Ill.	15	9:40 p. m.	11:30 p. m.	0.95	10:05 p. m.	10:40 p. m.	0.05	0.14	0.33	0.53	0.60	0.68	0.73	0.86	0.88						
Charleston, S. C.	22			0.53										0.53							
Charlotte, N. C.	14	4:05 a. m.	7:30 a. m.	1.29	4:20 a. m.	5:00 a. m.	0.08	0.09	0.30	0.46	0.70	0.87	0.92	1.01	1.08	1.10					
Chattanooga, Tenn.	15			0.13									0.13								
Chicago, Ill.	13			0.57																	
Cincinnati, Ohio	1			0.20						0.20								0.25			
Cleveland, Ohio	19	6:30 a. m.	9:22 a. m.	0.94	7:35 a. m.	7:56 a. m.	T.	0.18	0.39	0.59	0.72	0.76	0.79								
Columbia, Mo.	18	10:41 a. m.	11:30 a. m.	3.46	12:14 p. m.	2:07 p. m.	0.21	0.22	0.44	0.54	0.65	0.74	0.80	1.02	1.15	1.17	1.18	1.30	1.52	1.86	2.04
Columbia, S. C.	1	2:42 p. m.	4:00 p. m.	0.91	2:42 p. m.	3:21 p. m.	0.00	0.03	0.08	0.22	0.40	0.43	0.47	0.61	0.86	0.89	0.91				
Do	14-15	11:48 p. m.	12:45 a. m.	1.08	11:55 p. m.	12:20 a. m.	T.	0.13	0.36	0.69	0.89	1.00	1.02	1.06							
Do	15-16	10:53 p. m.	D. N.	0.46	10:53 p. m.	11:10 a. m.	0.00	0.10	0.31	0.43	0.45										
Columbus, Ohio	20	8:47 a. m.	9:40 a. m.	0.88	8:51 a. m.	9:13 a. m.	0.30	0.53	0.74	0.82	0.87										
Corpus Christi, Tex.	22			T.																	
Davenport, Iowa	12-13	8:01 p. m.	8:05 a. m.	2.85	3:35 a. m.	4:50 a. m.	0.97	0.11	0.30	0.36	0.44	0.55	0.61	0.70	0.81	1.01	1.12	1.34	1.59		
Denver, Colo	14			0.21														0.21			
Des Moines, Iowa	15	12:38 a. m.	6:20 a. m.	2.53	12:40 a. m.	12:55 a. m.	T.	0.37	0.59	0.65	0.70	0.74	0.76								
					5:05 a. m.	5:50 a. m.	1.58	0.08	0.15	0.24	0.31	0.44	0.50	0.64	0.81	0.91					
Do	19	6:35 p. m.	7:30 p. m.	0.79	6:45 p. m.	7:00 p. m.	T.	0.43	0.67	0.74	0.77	0.78									
Detroit, Mich.	31			0.25																	
Dodge, Kans	23			0.59														0.24			
Dubuque	10			0.59														0.59			
Duluth, Minn.	18	2:30 a. m.	6:50 a. m.	1.35	4:28 a. m.	4:55 a. m.	0.01	0.18	0.41	0.65	0.72	0.80	0.86	0.88					0.30			
Eastport, Me.	8			0.34										0.34							
Elkins, W. Va.	3	10:45 p. m.	11:50 p. m.	1.13	11:12 p. m.	11:28 p. m.	0.03	0.31	0.70	1.05	1.10										
Erie, Pa.	10			0.17														0.15			
Escanaba, Mich.	18			0.34														0.25			
Evansville, Ind	18			1.00														0.55			
Fort Smith, Ark	8-9			1.22														0.89			
Fort Worth, Tex	28			T.																	
Galveston, Tex †																					
Grand Haven	21			0.25																	
Grand Junction, Colo	11			0.29														0.25			
Green Bay, Wis.	7			0.63														0.20			
Harrisburg, Pa.	5	10:00 a. m.	11:40 a. m.	0.89	10:30 p. m.	10:57 p. m.	0.02	0.20	0.44	0.50	0.60	0.71	0.76	0.80	0.82	0.86					
Hatteras, N. C.	16	4:46 a. m.	8:05 a. m.	0.78	6:57 a. m.	7:25 a. m.	0.13	0.10	0.32	0.48	0.53	0.59	0.62								
Huron, S. Dak.	19	7:20 a. m.	1:40 p. m.	0.98	7:55 a. m.	8:20 a. m.	T.	0.07	0.25	0.42	0.48	0.53	0.56								
Indianapolis, Ind	5	10:05 p. m.	11:04 p. m.	0.61	10:20 p. m.	10:35 p. m.	T.	0.20	0.46	0.57	0.59										
Jacksonville, Fla.	3	5:40 p. m.	7:00 p. m.	0.72	6:24 p. m.	6:43 p. m.	T.	0.16	0.31	0.61	0.72										
Do	23	5:33 p. m.	7:08 p. m.	1.82	5:43 p. m.	6:30 p. m.	T.	0.04	0.45	0.97	1.20	1.33	1.38	1.44	1.55	1.68	1.74	1.80			
Jupiter, Fla.	2			0.46								0.45									
Kalispell, Mont	16			0.43														0.30			
Kansas City, Mo.	10	5:10 a. m.	9:00 a. m.	0.87	5:13 a. m.	5:28 a. m.	T.	0.17	0.35	0.47	0.50	0.52									
Key West, Fla.	26	11:30 a. m.	1:57 p. m.	1.38	12:02 p. m.	1:10 p. m.	0.06	0.16	0.30	0.43	0.52	0.60	0.68	0.79	0.86	0.92	0.98	1.11	1.28		
Knoxville, Tenn	1	D. N.	D. N.	0.87	1:20 p. m.	1:50 a. m.	0.01	0.08	0.34	0.55	0.67	0.76	0.81	0.83							
La Crosse, Wis.	30-31	10:55 p. m.	2:00 a. m.	1.31	12:05 a. m.	12:40 a. m.	0.24	0.07	0.11	0.17	0.28	0.50	0.66	0.75	0.77	0.79	0.87	1.00			
Lewiston, Idaho	16			0.55																	
Lexington, Ky.	21			0.66														0.18			
Lincoln, Nebr.	4-5	9:35 p. m.	D. N.	1.60	11:10 p. m.	12:10 a. m.	0.10	0.28	0.61	0.69	0.82	0.85	0.91	0.96	0.99	1.06	1.13	1.43			
Do	20	11:48 a. m.	2:50 p. m.	1.45	11:50 a. m.	12:05 p. m.	T.	0.20	0.48	0.54											
Little Rock, Ark	9			0.08																	
Los Angeles, Cal.	12			T.														0.08			
Louisville, Ky.	15	2:47 p. m.	4:00 p. m.	0.75	2:47 p. m.	3:00 p. m.	0.00	0.27	0.60	0.67	0.69	0.71									
Lynchburg	6	2:20 p. m.	3:25 p. m.	0.85	2:50 p. m.	3:00 p. m.	0.04	0.20	0.68	0.70	0.74										
Do	28	1:40 p. m.	3:25 p. m.	0.98	1:50 p. m.	2:15 p. m.	T.	0.20	0.64	0.78	0.82	0.90	0.94	0.95							
Macon, Ga.	27-28			0.62														0.29			
Memphis, Tenn	††	D. N.	1:55 p. m.	4.89	4:45 a. m.	5:50 a. m.	2.53	0.08	0.20	0.30	0.45	0.62	0.75	0.83	0.93	1.08	1.21	1.45	1.71	1.96	2.43
Meridian, Miss.	28	4:00 a. m.	11:30 a. m.	1.52	8:20 a. m.	9:00 a. m.	0.44	0.09	0.17	0.20	0.26	0.44	0.65	0.80	0.90	0.92	0.96	1.00			
Milwaukee, Wis.	7			0.30														0.11			
Montgomery, Ala.	2			0.63														0.63			
Nantucket, Mass	8			0.06														0.06			
Nashville, Tenn	21	6:17 p. m.	7:36 p. m.	1.80	6:43 p. m.	7:13 p. m.	0.16	0.30	0.73	1.05	1.37	1.49	1.53	1.60	1.64						
New Haven, Conn.	3			0.66														0.53			
New Orleans, La.	3	12:46 p. m.	3:20 p. m.	1.36	12:47 p. m.	1:25 p. m.	T.	0.31	0.55	0.67	0.82	1.00	1.17	1.25	1.30	1.32					
New York, N. Y.	6	3:00 a. m.	6:15 a. m.	1.05	5:14 a. m.	5:50 a. m.	0.04	0.05	0.28	0.61	0.85	0.87	0.90	0.96	0.97						
Norfolk, Va	4	6:10 p. m.	8:05 p. m.	0.90	6:14 p. m.	6:44 p. m.	T.	0.21	0.42	0.59	0.72	0.82	0.86	0.87							
Do	16	6:00 a. m.	10:30 a. m.	1.35	8:15 a. m.	8:55 a. m.	0.17	0.09	0.23	0.45	0.62	0.74	0.88	0.94	1.02	1.05	1.07	1.11			
Northfield, Vt.	6			0.80														0.49			
Oklahoma, Okla.	11	12:27 a. m.	3:10 a. m.	1.08	12:27 a. m.	12:50 a. m.	0.00	0.28	0.42	0.65	0.87	0.94	0.94	1.00							
Do	31	4:20 p. m.	5:30 p. m.	0.92	4:22 p. m.	4:45 p. m.	T.	0.17	0.48	0.78	0.85	0.87									
Omaha, Nebr.	22	2:30 a. m.	5:50 a. m.	0.92	3:25 a. m.	4:00 a. m.	0.11	0.10	0.13	0.18	0.29	0.49	0.58	0.62	0.66						
Palestine, Tex.	28			T.																	
Parkersburg, W. Va.	10			0.40									0.40								
Pensacola, Fla.	2	2:54 a. m.	4:59 a. m.	1.13	3:01 a. m.	3:25 a. m.	T.	0.08	0.18	0.37	0.74	0.84	0.85	0.87	0.93						
Philadelphia, Pa	6			0.47										0.43							
Pittsburg, Pa.	20			0.46																	
Pocatello, Idaho	11-12			0.09														0.43 *			
Portland, Me.	11	7:00 a. m.	10:50 a. m.	1.00	9:10 a. m.	9:53 a. m.	0.13	0.06	0.13	0.25	0.30	0.35	0.41	0.51	0.66	0.79	0.80				
Portland, Oreg.	16			0.42																	
Pueblo, Colo	30-31	9:10 p. m.	D. N.	0.94	10:20 p. m.	10:30 p. m.	T.	0.31	0.49	0.52	0.54	0.57	0.65	0.69	0.72				0.24			
Raleigh, N. C	10	7:10 p. m.	8:30 p. m.	0.51	7:12 p. m.	7:25 p. m.	T.	0.18	0.45	0.50											
Richmond, Va	15-16	9:17 p. m.	D. N.	0.99	3:00 a. m.	3:40 a. m.	0.23	0.05	0.17	0.37	0.48	0.51	0.61	0.68	0.69						
Rochester, N. Y.	7-8			0.70														0.27			
St. Louis, Mo	18	9:31 a. m.	5:30 p. m.	2.07	11:05 a. m.	11:40 a. m.	0.12	0.05	0.13	0.28	0.41	0.56	0.67	0.77	0.78						
St. Paul, Minn	9	7:10 p. m.	9:57 p. m.	3.06	8:10 p. m.	9:57 p. m.	0.02	0.06	0.12	0.33	0.71	1.12	1.57	2.02	2.18	2.27	2.38	2.51	2.69	2.93	3.04
Salt Lake City, Utah	28			0.07									0.07								
San Diego, Cal	12			T.																	
Sandusky, Ohio	20			0.49										0.49							
San Francisco, Cal	10			T.																	
Savannah, Ga	11	4:18 p. m.	6:03 p. m.	1.75	4:20 p. m.	5:50 p. m.	T.	0.18	0.32	0.34	0.35	0.39	0.46	0.50	0.65	0.88	1.01	1.21	1.57	1.75	
Do	28	1:13 p. m.	5:25 p. m.	1.61	2:40 p. m.	4:09 p. m.	0.04	0.06	0.12	0.21	0.34	0.39	0.46	0.62	0.77	0.88	0.96	1.12	1.47		

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	To—	Total amount of precipitation.	Excessive rate. Began—	Ended—	Amount before excessive began.	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Scranton, Pa	1	5:30 p. m.	7:32 p. m.	0.98	5:30 p. m.	6:00 p. m.	0.00	0.35	0.59	0.68	0.72	0.76	0.81	0.83	0.86						
Do	19	2:46 p. m.	3:10 p. m.	0.83	2:46 p. m.	3:00 p. m.	0.00	0.16	0.59	0.83											
Seattle, Wash	27			0.14														0.13		
Shreveport, La	1			0.02																
Spokane, Wash	17–18			0.17														0.08		
Springfield, Ill	18	D. N.	8:30 a. m.	1.27	6:05 a. m.	6:30 a. m.	0.01	0.16	0.39	0.59	0.84	0.94	0.96	0.98						
Springfield, Mo	22	10:32 a. m.	1:05 p. m.	1.05	10:40 a. m.	11:00 a. m.	0.03	0.17	0.54	0.72	0.77	0.81	0.84							
Tampa, Fla	6	11:25 a. m.	12:15 p. m.	1.10	11:33 a. m.	11:55 a. m.	0.03	0.20	0.61	0.73	0.84	0.87								
Do	15	2:45 p. m.	3:15 p. m.	0.94	2:47 p. m.	3:07 p. m.	0.01	0.29	0.66	0.87	0.93									
Do	18	3:00 p. m.	9:20 p. m.	1.39	5:35 p. m.	5:55 p. m.	0.28	0.20	0.37	0.47	0.54	0.58								
Do	29	5:50 p. m.	9:30 p. m.	1.01	6:05 p. m.	6:30 p. m.	T.	0.31	0.51	0.65	0.75	0.79	0.82	0.83						
Taylor, Tex.†																				
Toledo, Ohio	7	5:25 p. m.	6:20 p. m.	0.66	5:42 p. m.	5:57 p. m.	0.01	0.10	0.43	0.64	0.65									
Topeka, Kan	26–27	9:25 p. m.	4:15 a. m.	1.44	10:27 p. m.	10:55 p. m.	0.10	0.36	0.65	0.82	0.94	0.99	1.03	1.05						
Valentine, Nebr	16–17			0.43															0.43	
Vicksburg, Miss	28			0.33									0.33							
Washington, D. C	5–6	11:40 p. m.	12:55 a. m.	0.61	11:40 p. m.	11:59 p. m.	0.00	0.10	0.25	0.46	0.50	0.52								
Wilmington, N. C	6			0.40											0.40					
Yankton, S. Dak	25			1.86														*		
Basseterre, St. Kitts	18	11:40 a. m.	4:45 p. m.	3.06	12:20 p. m.	1:20 p. m.	0.10	0.16	0.26	0.40	0.58	0.89	1.24	1.53	1.72	1.81	1.83	2.08	2.31	2.42	2.77
Bridgetown, Barbados	20	7:51 p. m.	11:00 p. m.	2.66	9:32 p. m.	10:30 p. m.	0.27	0.21	0.41	0.58	0.89	1.14	1.27	1.33	1.37	1.44	1.69	1.97	2.10		
Cienfuegos, Cuba	4	5:00 p. m.	6:09 p. m.	0.76	5:05 p. m.	5:20 p. m.	0.03	0.34	0.52	0.66	0.69									
Do	12	2:44 p. m.	6:15 p. m.	1.15	2:49 p. m.	3:03 p. m.	0.02	0.19	0.62	0.80	0.81									
Do	21	3:38 p. m.	4:35 p. m.	0.84	3:49 p. m.	4:03 p. m.	0.04	0.18	0.46	0.72	0.73	0.77	0.79							
Do	22	3:24 p. m.	4:20 p. m.	0.80	3:33 p. m.	4:01 p. m.	0.01	0.19	0.46	0.58	0.67	0.73	0.78							
Do	27	9:27 a. m.	9:55 a. m.	0.85	9:32 a. m.	9:45 a. m.	T.	0.28	0.67	0.84	0.85									
Havana, Cuba	1	4:39 p. m.	5:46 p. m.	0.95	4:39 p. m.	5:05 p. m.	0.20	0.47	0.69	0.84	0.90	0.92	0.93							
Kingston, Jamaica	21	2:07 p. m.	2:47 p. m.	0.55	2:10 p. m.	2:30 p. m.	0.01	0.05	0.22	0.39	0.50	0.51								
Puerto Principe, Cuba	2	2:54 p. m.	7:10 p. m.	2.46	2:55 p. m.	4:15 p. m.	T.	0.31	1.19	1.38	1.40	1.41	1.45	1.49	1.50	1.65	1.76	1.92	2.32		
Do	12	12:52 p. m.	1:45 p. m.	2.18	12:52 p. m.	1:35 p. m.	0.00	0.07	0.33	0.56	0.74	1.14	1.49	1.88	2.05	2.15	2.18				
Do	22	6:09 p. m.	9:21 p. m.	4.47	{ 6:25 p. m.	7:10 p. m.	0.03	0.15	0.41	0.53	0.63	0.74	1.23	1.47	1.54	1.61					
					7:35 p. m.	8:25 p. m.	1.85	0.12	0.25	0.51	1.07	1.62	2.02	2.22	2.31	2.39	2.44	2.49			
San Juan, Porto Rico	28	10:20 a. m.	11:25 a. m.	0.75	10:40 a. m.	11:05 a. m.	0.06	0.16	0.35	0.51	0.59	0.64	0.67							
Do	31	3:50 p. m.	5:41 p. m.	0.90	4:15 p. m.	4:32 p. m.	0.01	0.21	0.56	0.81	0.84	0.86								
Santiago de Cuba, Cuba	13			0.20														0.20		
Santo Domingo, S. Dom	12	12:48 p. m.	2:55 p. m.	0.55	12:50 p. m.	1:05 p. m.	T.	0.29	0.48	0.55										
Do	13	12:11 p. m.	4:15 p. m.	1.25	2:17 p. m.	2:40 p. m.	0.57	0.21	0.51	0.59	0.65	0.66								

*Self register not working.　　　　　† No precipitation during the month.　　　　　‡ July 31–August 1.

TABLE VI.—*Data furnished by the Canadian Meteorological Service, August, 1902.*

Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hours.	Departure from normal.	Temperature. Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Precipitation. Total.	Departure from normal.	Depth of snow.	Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hours.	Departure from normal.	Temperature. Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Precipitation. Total.	Departure from normal.	Depth of snow.
	Ins.	Ins.	Ins.	°	°	°	°	Ins.	Ins.	Ins.		Ins.	Ins.	Ins.	°	°	°	°	Ins.	Ins.	Ins.
St. Johns, N. F	29.79	29.92	−.04	59.9	+ 0.1	66.9	52.9	2.44	−1.64		Parry Sound, Ont	29.29	29.97	−.01	63.2	− 0.3	73.5	53.0	2.70	− 0.02	
Sydney, C. B. I	29.88	29.92	−.03	64.2	+ 0.9	73.2	55.3	7.86	+4.24		Port Arthur, Ont	29.26	29.97	+.01	58.9	− 0.6	68.6	49.2	3.01	+ 0.26	
Halifax, N. S	29.81	29.91	−.05	64.1	+ 0.5	72.2	56.0	4.76	+0.41		Winnipeg, Man	29.09	29.91	−.03	64.2	+ 0.8	77.6	50.9	0.93	− 1.74	
Grand Manan, N. B	29.83	29.88	−.07	62.1	+ 0.6	69.7	54.5	3.63	−0.03		Minnedosa, Man	28.15	29.93	−.01	63.0	+ 3.6	76.5	49.6	0.96	− 1.14	
Yarmouth, N. S	29.85	29.92	−.05	60.7	+ 0.5	67.4	54.0	2.42	−1.59		Qu'Appelle, Assin	27.67	29.88	−.05	62.9	+ 1.4	75.9	49.9	1.34	− 0.30	
Charlottetown, P. E. I	29.84	29.88	−.06	66.4	+ 2.1	74.3	58.5	3.12	−0.62		Medicine Hat, Assin	27.38	29.91	−.02	63.1	− 0.9	77.9	48.2	1.44	− 0.47	
Chatham, N. B	29.82	29.84	−.09	64.6	+ 1.4	74.4	54.8	4.47	+0.43		Swift Current, Assin	27.38	29.91	−.02	63.1	− 0.9	77.9	48.2	1.44	− 0.47	
Father Point, Que	29.83	29.85	−.06	56.3	+ 0.7	64.0	48.7	5.80	+2.75		Calgary, Alberta	26.40	29.87	−.04	58.1	− 1.3	71.5	44.7	6.40	+ 4.26	
Quebec, Que	29.58	29.90	−.03	62.2	− 0.9	70.9	53.4	3.88	+0.05		Banff, Alberta	25.40	29.93	+.02	54.2	− 2.1	68.9	39.5	2.91	+ 0.38	
Montreal, Que	29.72	29.92	−.03	65.0	− 1.4	72.7	57.4	4.41	+0.84		Edmonton, Alberta	27.60	29.85	−.07	60.0	+ 1.2	72.4	47.6	1.72	− 0.41	
Bissett, Ont	29.33	29.98	+.02	59.6	− 3.6	73.9	45.3	2.96	+0.01		Prince Albert, Sask	27.60	29.82	−.10	61.7	+ 2.8	73.4	50.0	1.98	− 0.17	
Ottawa, Ont	29.69	30.01	+.05	65.1	+ 0.3	75.6	54.7	1.67	−1.36		Battleford, Sask	28.16	29.88	−.63	63.3	+ 0.7	76.4	50.3	1.26	− 1.10	
Kingston, Ont	29.63	29.94	−.04	64.8	− 2.2	72.9	56.7	2.04	−0.34		Kamloops, B. C	28.71	29.90	−.01	67.3	− 1.3	81.7	52.9	0.86	− 0.23	
Toronto, Ont	29.60	29.96	−.03	65.5	− 0.5	75.2	55.8	2.38	−0.38		Victoria, B. C	29.97	30.06	+.05	60.8	+ 2.1	68.8	52.7	0.43	− 0.17	
White River, Ont	28.69	29.99	+.03	55.7	− 0.7	70.1	41.3	2.25	−1.05		Barkerville, B. C	25.72	30.00	+.10	51.7	− 4.6	64.8	38.6	3.46	+ 0.36	
Port Stanley, Ont	29.35	29.99	−.01	64.7	− 1.2	75.0	54.4	2.12	−0.30		Hamilton, Bermuda	29.88	30.04	−.06	78.2	− 1.4	83.8	72.6	21.33	+15.25	
Saugeen, Ont	29.29	29.99	.00	62.9	− 0.9	71.5	54.3	3.63	+1.38												

TABLE VII.—*Heights of rivers referred to zeros of gages, August, 1902.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Date.	Lowest water. Height.	Date.	Mean stage.	Monthly range.	Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Date.	Lowest water. Height.	Date.	Mean stage.	Monthly range.
Mississippi River.	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.	*Mississippi River—Cont'd.*	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
St. Paul, Minn	1,954	14	3.4	1	1.4	29–31	2.1	2.0	St. Louis, Mo	1,264	30	22.7	1	14.8	18	18.3	7.9
Reeds Landing, Minn	1,884	12	2.2	1	0.5	28, 29	1.2	1.7	Chester, Ill	1,189	30	19.6	1	11.9	18	15.0	7.7
La Crosse, Wis	1,819	12	4.3	1	1.4	30	2.4	2.9	New Madrid, Mo	1,003	34	21.3	1	13.5	21	16.4	7.8
Prairie du Chien, Wis	1,759	18	4.0	1	0.9	31	2.2	3.1	Memphis, Tenn	843	33	19.6	1	9.3	23, 24	12.9	10.3
Dubuque, Iowa	1,699	15	4.9	1	1.7	30, 31	3.0	3.2	Helena, Ark	767	42	27.8	1	14.7	25	19.7	13.1
Leclaire, Iowa	1,609	10	3.6	1	0.9	31	2.0	2.7	Arkansas City, Ark	635	42	30.0	2, 3	15.7	26	22.0	14.3
Davenport, Iowa	1,593	15	5.1	1	2.0	31	3.5	3.1	Greenville, Miss	595	42	25.0	3	12.6	26, 27	18.0	12.4
Muscatine, Iowa	1,562	16	6.6	1	2.9	30, 31	4.6	3.7	Vicksburg, Miss	474	45	27.9	3, 4	13.7	28, 29	20.9	14.2
Galland, Iowa	1,472	8	4.8	19	2.5	31	3.7	2.3	New Orleans, La	108	16	9.1	7, 9	4.8	31	7.3	4.3
Keokuk, Iowa	1,463	15	10.0	22	5.4	31	7.2	4.6	*Yellowstone River.*								
Hannibal, Mo	1,402	13	11.7	22, 23	6.2	15	8.7	5.5	Glendive, Mont	98	17						
Grafton, Ill	1,306	23	16.3	1	10.8	17	13.4	5.5									

TABLE VII.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
James River.	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
Lamoure, N. Dak.	....	25	1.2	2	0.1	16	0.6	1.1
Huron, S. Dak.	210	9	2.5	1	1.3	25-31	1.6	1.2
Missouri River.								
Townsend, Mont.	2,504	10	3.8	1-3	3.5	11-14,29-31	3.6	0.3
Fort Benton, Mont.	2,285	12	1.4	1	0.4	19-21	0.7	1.0
Buford, N. Dak.								
Bismarck, N. Dak.	1,309	14	5.1	1	2.0	31	3.4	3.1
Pierre, S. Dak.	1,114	14	6.3	2	3.6	31	4.6	2.7
Sioux City, Iowa	784	19	10.1	28	7.8	23	8.7	2.3
Omaha, Nebr	669	18	10.3	3	8.7	20,21,24,25	9.4	2.6
St. Joseph, Mo.	481	10	6.0	31	3.1	14,22	4.1	2.9
Kansas City, Mo.	388	21	14.8	31	9.3	19	11.6	5.5
Boonville, Mo.	199	20	13.0	1,31	9.7	18	11.1	3.3
Hermann, Mo.	103	24	14.5	31	8.5	18	10.5	6.0
Illinois River.								
Peoria, Ill.	135	14	16.5	1	11.8	31	14.1	4.7
Youghiogheny River.								
Confluence, Pa.	59	10	1.9	7,8	0.6	29-31	1.2	1.3
West Newton, Pa.	15	23	2.0	1	0.1	30,31	0.8	1.9
Allegheny River.								
Warren, Pa.	177	14	3.0	1	0.1	31	1.2	2.9
Oil City, Pa	123	13	3.8	1	0.7	30,31	1.7	3.1
Parker, Pa.	73	20	4.8	1	0.3	31	1.8	4.5
Monongahela River.								
Weston, W. Va.	161	18	0.0	2-4	-0.7	19-21	-0.3	0.7
Fairmont, W. Va.	119	25	4.8	1	1.0	30,31	1.6	3.8
Greensboro, Pa.	81	18	9.7	1	6.6	20-25,31	7.2	3.1
Lock No. 4, Pa.	40	28	10.0	2	6.2	15,16	7.4	3.8
Conemaugh River.								
Johnstown, Pa.	64	7	2.8	1	0.9	31	2.0	1.9
Red Bank Creek.								
Brookville, Pa.	35	8	1.2	1	0.2	8,9,18-31	0.6	1.0
Beaver River.								
Elwood Junction, Pa.	10	14	3.4	1	2.4	18-31	2.6	1.0
Great Kanawha River.								
Charleston, W. Va.	58	30	6.9	2,11	6.1	31	6.6	0.8
Little Kanawha River.								
Glenville, W. Va	103	20	3.6	2	-2.0	31	0.3	5.6
New River.								
Hinton, W. Va.	95	14	1.7	9	1.1	28,30,31	1.4	0.6
Cheat River.								
Rowlesburg, W. Va.	36	14	3.0	1	1.0	21	2.0	2.0
Ohio River.								
Pittsburg, Pa.	966	22	6.8	1	3.6	7	5.7	3.2
Davis Island Dam, Pa.	960	25	8.3	1	2.4	41	4.3	5.9
Wheeling, W. Va.	875	36	11.9	1	2.4	31	5.4	9.5
Parkersburg, W. Va.	785	36	11.0	1,2	3.0	31	6.2	8.0
Point Pleasant, W. Va.	703	39	11.4	3	1.9	31	5.2	9.5
Huntington, W. Va.	660	50	15.1	3	4.3	31	8.4	10.8
Catlettsburg, Ky.	651	50	14.6	3	2.2	31	6.8	12.4
Portsmouth, Ohio	612	50	14.6	4	3.8	31	8.1	10.8
Cincinnati, Ohio.	499	50	15.7	5	5.8	30,31	9.9	9.9
Madison, Ind	413	46	13.2	6	5.5	31	9.0	7.7
Louisville, Ky	367	28	7.6	6,7	3.4	31	5.4	4.2
Evansville, Ind	184	35	10.8	1,2	3.8	31	7.6	7.0
Paducah, Ky.	47	40	11.1	1	4.4	31	6.7	6.7
Cairo, Ill.	1,073	45	25.0	1	15.4	21	19.0	9.6
Muskingum River.								
Zanesville, Ohio	70	20	8.0	1	5.6	30,31	6.4	2.4
Scioto River.								
Columbus, Ohio.	110	17	3.5	1	2.2	29-31	2.6	1.3
Miami River.								
Dayton, Ohio	77	18	1.4	4,5	0.5	24,26,27, 29,30	0.8	0.9
Wabash River.								
Mount Carmel, Ill.	50	15	4.9	11	2.5	31	3.9	2.4
Licking River.								
Falmouth, Ky.	30	25	2.2	13,14	0.2	29-31	1.1	2.0
Kentucky River.								
Frankfort, Ky.	65	31	6.6	21	5.4	16	5.9	1.2
Clinch River.								
Speers Ferry, Va.	156	20	0.8	8	-0.8	30,31	-0.1	1.6
Clinton, Tenn.	52	25	3.8	11,12	2.8	20,21,29-31	3.1	1.0
Holston River.								
Rogersville, Tenn.	103	14	3.1	8	1.7	30,31	2.0	1.4
French Broad River.								
Leadvale, Tenn.	70	15	....					
Tennessee River.								
Knoxville, Tenn.	635	29	2.3	9	0.4	28-31	0.9	1.9
Kingston, Tenn.	556	25	2.0	10	1.0	15-31	1.2	1.0
Chattanooga, Tenn.	452	33	2.8	6,11	1.4	20,25,26	1.9	1.4
Bridgeport, Ala.	402	24	1.2	7	0.3	25-29	0.7	0.9
Tennessee River.—Cont'd.								
Florence, Ala.	255	16	1.2	2,3	0.1	28,29	0.7	1.1
Riverton, Ala.	225	25	1.2	2	-1.2	21,23,24, 26-29	-0.6	2.4
Johnsonville, Tenn.	95	24	2.7	4	0.5	26,27,31	1.3	2.2
Cumberland River.								
Burnside, Ky.	516	50	2.5	20	0.6	4,5	1.5	1.9
Carthage, Tenn.	305	40	4.0	7	0.5	31	1.4	3.5
Nashville, Tenn.	189	40	4.2	8,9	1.5	31	2.2	2.7
Clarksville, Tenn.	126	42	5.4	11	2.0	31	3.1	3.4

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Arkansas River.	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
Wichita, Kans.	832	10	4.2	27	1.5	8	2.4	2.7
Webbers Falls, Ind. T.	465	23	7.5	29,30	1.5	22-25	3.5	6.0
Fort Smith, Ark.	403	22	7.8	31	2.8	25,26	4.8	6.0
Dardanelle, Ark	256	21	6.0	16,31	1.7	28	3.9	4.3
Little Rock, Ark.	176	23	9.5	1	3.3	28,29	3.5	6.2
White River.								
Newport, Ark.	150	26	1.4	3	0.2	15,19-25	0.6	1.2
Yazoo River.								
Yazoo City, Miss.	80	25	4.7	9-12	-0.6	31	3.2	5.3
Red River.								
Arthur City, Tex.	638	27	6.5	3	4.1	29-31	5.2	2.4
Fulton, Ark. *	515	28	18.2	2	4.7	31	8.5	13.5
Shreveport, La.	327	29	16.3	5	6.5	31	12.5	9.8
Alexandria, La.	118	33	14.0	9,10	4.6	1	11.0	9.4
Ouachita River.								
Camden, Ark.	304	39	32.0	5	4.7	31	14.5	27.3
Monroe, La.	122	40	17.0	18	3.4	1	12.0	13.6
Atchafalaya River.								
Melville, La.	100	31	25.9	9	16.6	31	22.3	9.3
Susquehanna River.								
Binghamton, N. Y.	306	16	6.8	2	2.9	31	3.7	3.9
Towanda, Pa.	262	16	6.6	2	1.0	28	2.3	5.5
Wilkesbarre, Pa	183	17	11.1	3	3.6	28-31	5.2	7.5
Harrisburg, Pa.	69	17	6.2	4	1.2	30-31	3.1	5.0
West Branch Susquehanna.								
Lock Haven, Pa.	65	12	1.2	1				
Williamsport, Pa.	39	20	5.0	1	0.4	28	2.1	4.6
Juniata River.								
Huntingdon, Pa.	90	24	4.3	2	3.0	17-31	3.2	1.3
Potomac River.								
Cumberland, Md.	290	8	3.2	2	0.6	31	2.0	2.6
Harpers Ferry, W. Va.	172	18	2.0	4,5	-0.5	16,17,22-31	0.0	2.5
James River.								
Lynchburg, Va	260	18	0.7	7,11	0.1	27,28	0.5	0.6
Richmond, Va.	111	12	1.0	6-7	-0.5	26,27	0.2	1.5
Roanoke River.								
Weldon, N. C.	129	30	10.6	18	8.0	31	8.8	2.6
Cape Fear River.								
Fayetteville, N. C.	112	38	3.4	13	1.2	31	2.1	2.2
Edisto River.								
Edisto, S. C.	75	6	4.2	25,26	1.2	1	2.7	3.0
Pedee River.								
Cheraw, S. C.	149	27	12.8	17	1.5	31	3.0	11.3
Black River.								
Kingstree, S. C.	52	12	1.8	20-21	-0.4	4,5	0.7	2.2
Lynch Creek.								
Effingham, S. C.	35	12	4.9	25	2.6	15	3.5	2.3
Santee River.								
St. Stephens, S. C.	97	12	7.1	21,22	1.8	11	4.2	5.3
Congaree River.								
Columbia, S. C.	37	15	3.5	16	0.3	27	1.1	3.2
Wateree River.								
Camden, S. C.	45	24	26.3	15	5.0	27	7.9	21.3
Waccamaw River.								
Conway, S. C.	40	7	2.6	25,26	0.9	3	1.7	1.7
Savannah River.								
Calhoun Falls, S. C.	347	15	3.7	* 3	2.0	10-12,23,26	2.5	1.7
Augusta, Ga.	268	32	9.8	* 16	7.2	10	8.0	2.6
Broad River.								
Carlton, Ga.	30	11	5.0	14	2.1	9-11	2.7	2.9
Flint River.								
Albany, Ga.	80	20	3.8	15	1.8	26	2.7	2.0
Chattahoochee River.								
Westpoint, Ga.	239	20	4.1	30	1.2	26	2.1	2.9
Ocmulgee River.								
Macon, Ga.	125	18	9.5	6	3.2	26,27	4.3	6.3
Oconee River.								
Dublin, Ga	79	30	4.4	7	-0.4	26,27	1.3	4.8
Coosa River.								
Rome, Ga.	271	30	1.7	29	0.3	11-12	0.9	1.3
Gadsden, Ga.	144	18	1.4	30	-0.5	22,23,28	-0.1	1.9
Alabama River.								
Montgomery, Ala.	265	35	3.5	31	-0.1	25	0.6	3.6
Selma, Ala.	212	35	1.5	7	-0.4	25,27	0.5	1.9
Tombigbee River.								
Columbus, Miss.	303	33	-0.1	5	-3.6	25-27	-2.6	3.5
Demopolis, Ala.	155	35	1.8	8	-3.1	27	-1.0	4.9
Black Warrior River.								
Tuscaloosa, Ala.	90	43	2.3	6	0.0	1-3,19-21,26	0.5	2.3
Brazos River.								
Kopperl, Tex	369	21	7.0	1	-2.0	20-31	-1.1	9.0
Waco, Tex.	301	24	12.1	1	3.2	29-31	5.0	8.9
Booth, Tex	76	39	38.0	8	3.5	31	16.6	34.5
Red River of the North.								
Moorhead, Minn.	418	26	8.5	5,6	7.7	31	8.1	0.8
Columbia River.								
Umatilla, Oreg.	270	25	12.9	1	7.4	31	9.7	5.5
The Dalles, Oreg.	166	40	20.0	1	10.6	31	14.5	9.4
Willamette River.								
Albany, Oreg.	118	20	1.5	1-5	1.0	28-31	1.3	0.5
Portland, Oreg.	12	15	10.8	1	4.3	28	7.3	6.5
Sacramento River.								
Red Bluff, Cal.	265	23	0.5	17	0.2	10-15,20-31	0.3	0.3
Sacramento, Cal.	64	29	9.7	1	7.9	31	8.6	1.8

*29 days only.

CLIMATOLOGY OF COSTA RICA.

Communicated by H. Pittier, Director, Physical Geographic Institute.

Table 1.—*Hourly observations at the Observatory, San Jose de Costa Rica during August, 1902.*

Hours.	Pressure. Observed, 1902.	Pressure. Normal, 1889–1900.	Temperature. Observed, 1902.	Temperature. Normal, 1889–1900.	Relative humidity. Observed, 1902.	Relative humidity. Normal, 1889–1900.	Rainfall. Observed, 1902.	Rainfall. Normal, 1889–1900.	Duration, 1902.
	660+ Mm.	660+ Mm.	°C.	°C.	\$	\$	Mm.	Mm.	Hrs.
1 a. m	3.71	4.00	17.95	17.45	89	91	0.4	0.7	0.33
2 a. m	3.36	3.58	17.83	17.43	89	91	1.5	0.5	1.50
3 a. m	3.01	3.26	17.50	17.36	90	91	7.3	0.4	2.00
4 a. m	2.84	3.06	17.32	16.99	90	92	1.2	0.3	1.83
5 a. m	2.84	3.09	17.26	16.88	90	90	2.6	0.5	2.58
6 a. m	2.99	3.29	17.26	16.72	90	91	1.5	0.7	2.08
7 a. m	3.17	3.55	17.52	16.90	88	90	1.4	1.2	1.25
8 a. m	3.41	3.88	19.42	19.00	78	85	0.7	2.2	1.75
9 a. m	3.87	4.12	21.37	20.70	70	78	0.5	1.3	1.00
10 a. m	4.08	4.29	22.52	20.50	71	73	0.7	2.3	1.50
11 a. m	3.97	4.24	23.19	23.24	67	70	3.1	3.2	2.08
Noon	3.79	3.98	24.15	24.36	63	70	1.6	6.3	0.84
1 p. m	3.34	3.59	24.33	24.47	67	69	6.7	10.0	1.00
2 p. m	2.89	3.11	24.05	23.95	67	71	4.5	19.5	1.24
3 p. m	2.46	2.81	23.76	23.01	68	73	42.3	30.7	4.49
4 p. m	2.26	2.57	23.20	21.85	72	78	4.9	34.3	3.00
5 p. m	2.26	2.68	21.94	20.68	76	82	5.8	46.3	3.09
6 p. m	2.54	3.02	20.78	20.00	81	86	15.8	32.8	3.92
7 p. m	2.89	3.41	19.80	19.21	84	88	1.8	28.0	4.83
8 p. m	3.19	3.80	19.41	18.72	88	89	4.6	20.3	3.58
9 p. m	3.55	4.13	19.07	18.46	86	90	5.7	8.2	2.25
10 p. m	3.82	4.34	18.78	18.10	86	90	0.9	3.7	1.00
11 p. m	4.02	4.46	18.48	17.96	87	90	0.0	2.2	0.00
Midnight	3.96	4.31	18.27	17.69	88	90	0.0	1.2	0.00
Mean	663.25	......	20.18	......	80	......			
Minimum	660.80	660.63	14.8	13.2	44	......			
Maximum	665.0	666.72	27.09	29.3	100	......	19.6	......	
Total	......	......	......	......	......	......	115.5	256.9	47.14

Remarks.—At San Jose the barometer is 1,169 meters above sea level. Readings are corrected for gravity, temperature, and instrumental error. The hourly readings for pressure, and wet and dry bulb thermometers, are obtained by means of Richard register-ing instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The thermometers are 1.5 meters above ground and are corrected for instrumental errors. The total hourly rainfall is as given by Hottinger's self-register, checked once a day. Under maximum, the greatest hourly rainfall for the month is given. The standard rain gage is 1.5 meters above ground. Since January 1, 1902, observations at San Jose have been made on seventy-fifth meridian time, which is 0 hours, 36 minutes, 13.3 seconds *in advance* of San Jose local time. The normals for pressure, temperature, and relative humidity have been adjusted to this time; the normal for rainfall in Table 1 and the sunshine observa-tions and normal in Table 2 refer to local time. At Port Limon the hours of direct obser-vation are 8 a. m., 2 and 8 p. m., San Jose local time; the barometer is 3.4 meters above sea level. The means for temperature and relative humidity in Table 4 are obtained from two-hourly readings given by a Richard self-registering thermometer.

Table 2.

Time.	Sunshine. Observed, 1902.	Sunshine. Normal, 1889–1900.	Cloudiness. Observed, 1902.	Cloudiness. Normal, 1889–1900.	Temperature of the soil at depth of— 0.15 m.	0.30 m.	0.60 m.	1.20 m.	3.00 m.
	Hours.	Hours.	\$	\$	°C.	°C.	°C.	°C.	°C.
7 a. m	9.39	8.32	70	59	21.05	21.33	22.05	21.97	21.69
8 a. m	19.58	18.32							
9 a. m	19.32	19.95							
10 a. m	16.22	17.86	85	70	21.20	21.39	22.08	22.03	
11 a. m	13.95	15.63							
Noon	12.08	12.97							
1 p. m	12.49	11.37	80	84	21.58	21.48	22.09	22.03	
2 p. m	13.77	11.22							
3 p. m	14.33	9.05							
4 p. m	10.22	5.87	87	93	21.81	21.54	22.06	21.98	
5 p. m	4.24	2.72							
6 p. m	1.33	0.83							
7 p. m			79	90	21.78	21.63	22.07	21.97	
8 p. m									
9 p. m									
10 p. m			66	76	21.60	21.61	22.07	21.97	
11 p. m									
Midnight									
Mean			79	79	21.51	21.51	22.07	21.99	21.69
Total	146.92	134.09							

Table 3.—*Rainfall at stations in Costa Rica, August, 1902.*

Stations.	Height above sea level.	Observed, 1902. Amount.	Observed, 1902. Number of days.	Averages. Number of years.	Averages. Amount.	Averages. Number of days.
	Meters.	Mm.			Mm.	
Sipurio (Talamanca)	60	440	19	2	155	18
Boca Banano	3	319	25	6	341	20
Port Limon	3	301	20	7	407	22
Swamp Mouth	3	445	24	4	83	10
Zent	20	458	21	1	84	13
Siquirres	60	438	19	3	280	14
Dos Novillos	122	420	20			
Guapiles	300	554	20	2	477	21
Cariblanco (Sarapiqui)	835	778	29	4	385	28
San Carlos	161	460	24	4	341	24
Las Lomas	266	*	*	2	273	15
Peralta	332	568	23	4	256	19
Turrialba	620	396	19	7	247	18
Juan Viñas	1,040	323	15	6	191	12
Santiago	1,100	252	19	1	111	17
Paraiso	1,336	176	9	1	218	20
Cachi	1,020	*	*			
Las Concavas	1,337	176	19	1	176	19
Tres Rios	1,300	105	14	12	241	18
San Isidro Arenilla	236		10			
San Francisco Guadalupe	1,187	64	11	6	245	22
San Jose	1,160	116	18	12	257	24
La Verbena	1,140	75	14	6	211	18
Nuestro Amo	791	50	7	6	198	15
Alajuela	950			2	318	16
San Isidro Alajuela	1,346	236	10	1	553	22

* Not received.

Table 4.—*Observations taken at Port Limon and Zent, August, 1902.*

Stations.	Pressure. Minimum.	Pressure. Maximum.	Pressure. Mean.	Temperature. Minimum.	Temperature. Maximum.	Temperature. Mean.	Relative humidity.
	Inches.	Inches.	Inches.	°C.	°C.	°C.	\$
Port Limon	755.82	760.14	757.12	21.1	32.0	25.81	88
Zent	......	......	......	20.2	34.5	26.29	86

Stations.	Cloudiness.	Sunshine.	Rainfall. Amount.	Rainfall. Number of days.	Temperature of soil at depth of— 0.15 m.	0.30 m.	0.60 m.
	\$	Hours.	Mm.		°C.	°C.	°C.
Port Limon	65	176.66	301.0	20	......	......	......
Zent	75	457.5		21	27.34	26.54	26.49

MEXICAN CLIMATOLOGICAL DATA.

By Señor Manuel E. Pastrana, Director of the Central Meteorologic-Magnetic Observatory.

August, 1902.

| Stations.	Altitude.	Mean barometer.	Temperature. Max.	Temperature. Min.	Temperature. Mean.	Relative humidity.	Precipitation.	Prevailing direction. Wind.	Prevailing direction. Cloud.
	Feet.	Inch.	°F.	°F.	°F.	\$	Inch.		
Chihuahua	4,684	25.22	90.5	62.1	73.0	64	5.31	e.	......
Guadalajara (Obs. del Est.)	5,186	24.92	83.7	59.5	70.7	71	7.36	e.	......
Guanajuato	6,640	23.67	88.2	55.6	69.1	55	4.40	ene.	......
Leon (Guanajuato)	5,906	24.27	86.4	52.9	69.8	68	1.74	ese.	e.
Mazatlan	25	29.83	91.6	74.7	84.0	76	3.90	nw.	......
Merida	50	29.94	97.7	64.9	78.6	75	5.46	ne.	......
Mexico (Obs. Cent.)	7,472	23.03	77.9	50.4	62.8	67	5.06	n.	ne.
Monterey (Seminario)	1,626	28.11	100.8		84.8	54	0.04	se.	......
Morelia (Seminario)	6,401	23.94	81.1	51.8	63.3	79	3.76	s.	ne.
Puebla (Col. d Est.)	7,118	23.34	79.5	42.8	63.0	69	4.29	ene.	......
Puebla (Col. Cat.)	7,108	23.35	82.4	52.2	65.7	69	5.86		......
Queretaro	6,070	24.14	85.1	55.9	68.5	61	4.17	e.	......
Toluca	8,812	21.95	73.4	42.4	57.7	69	4.46	ne	......
Zacatecas	8,015		80.2	48.4	63.7	59	1.32	e.	......
Zapotlan	5,078	25.06	84.2	58.6	71.1	68	3.36	se.	......

XXX—67. Chart I. Tracks of Centers of High Areas. August, 1902.
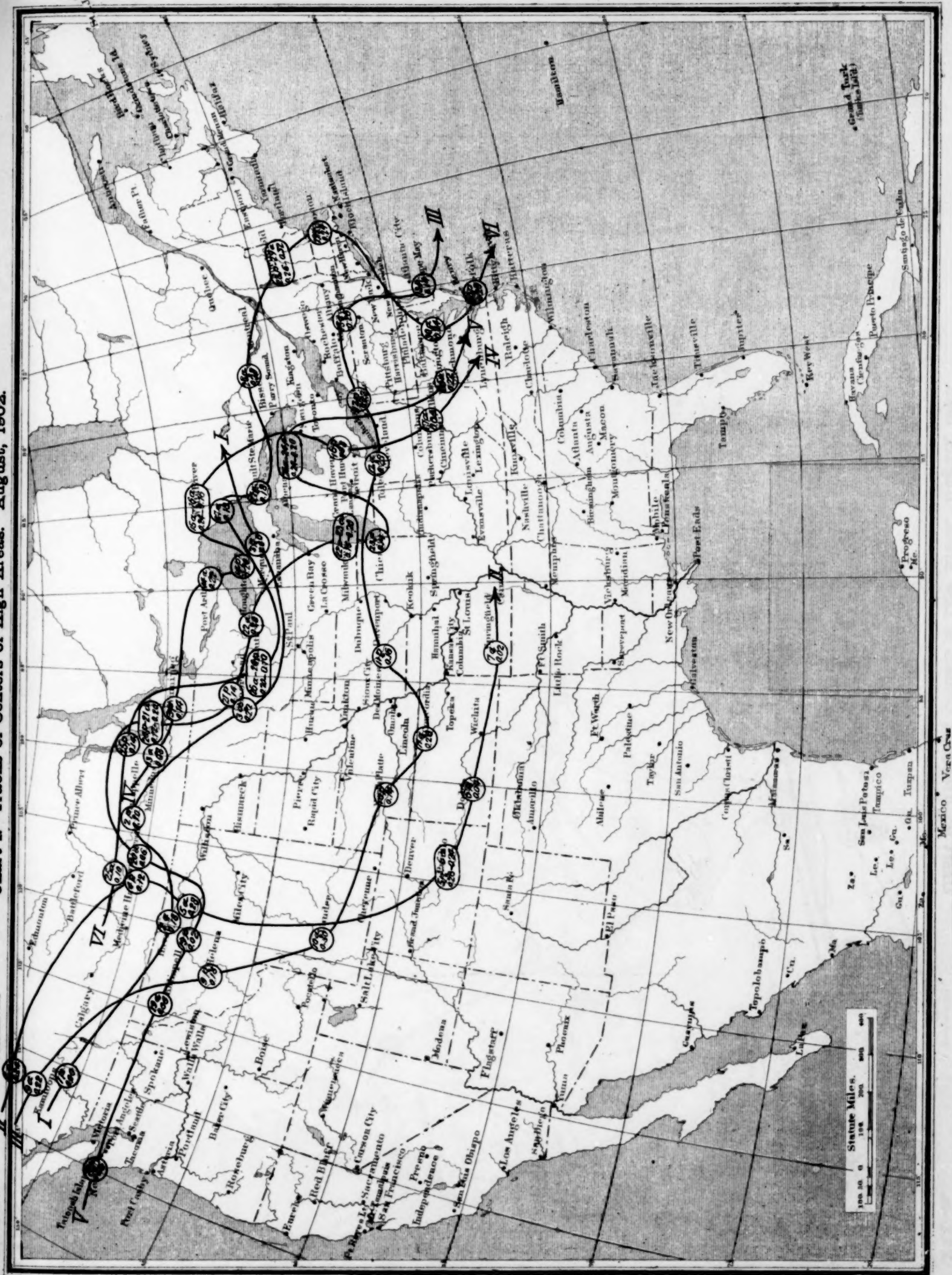
Chart II. Tracks of Centers of Low Areas. August, 1902.

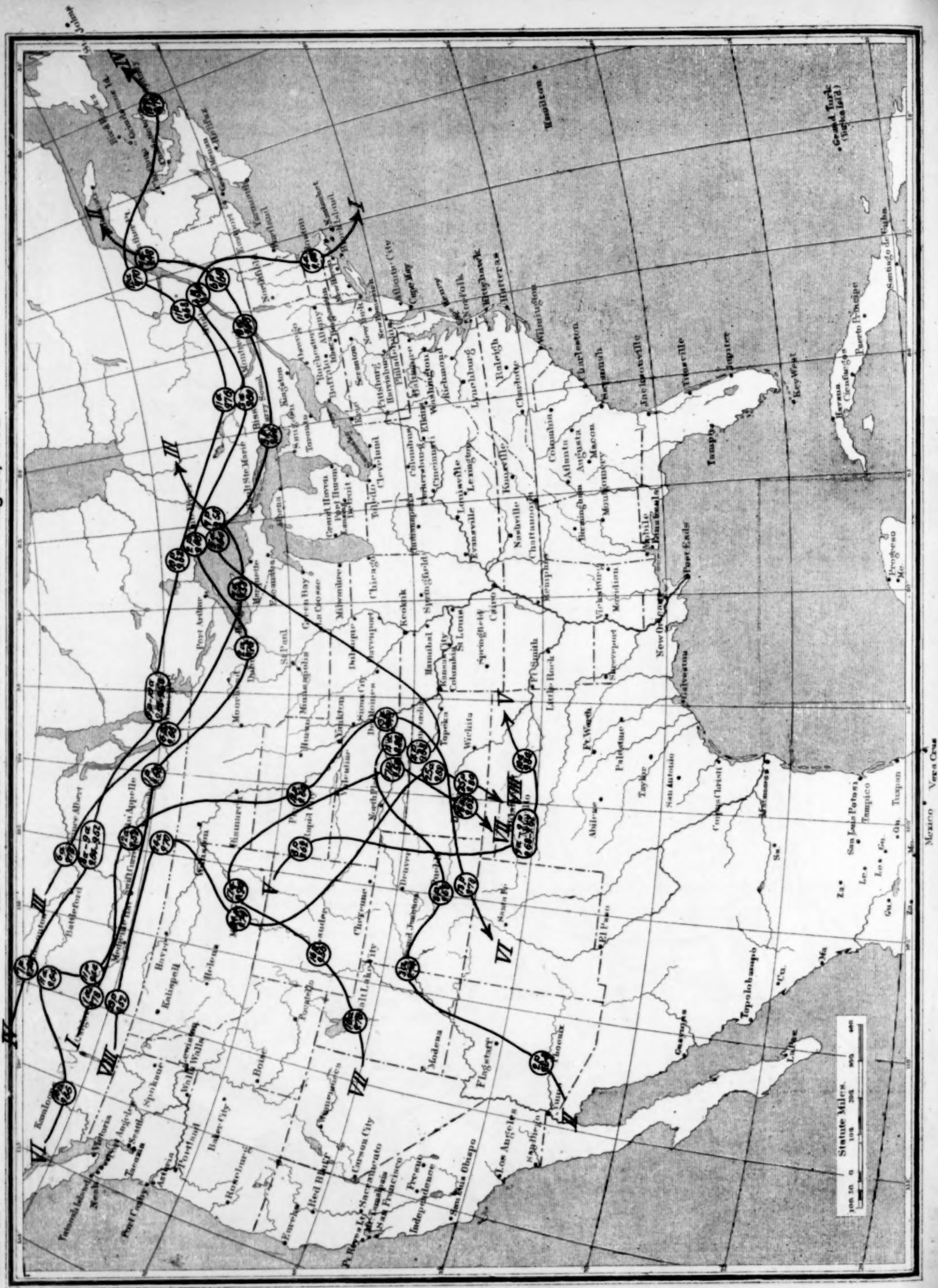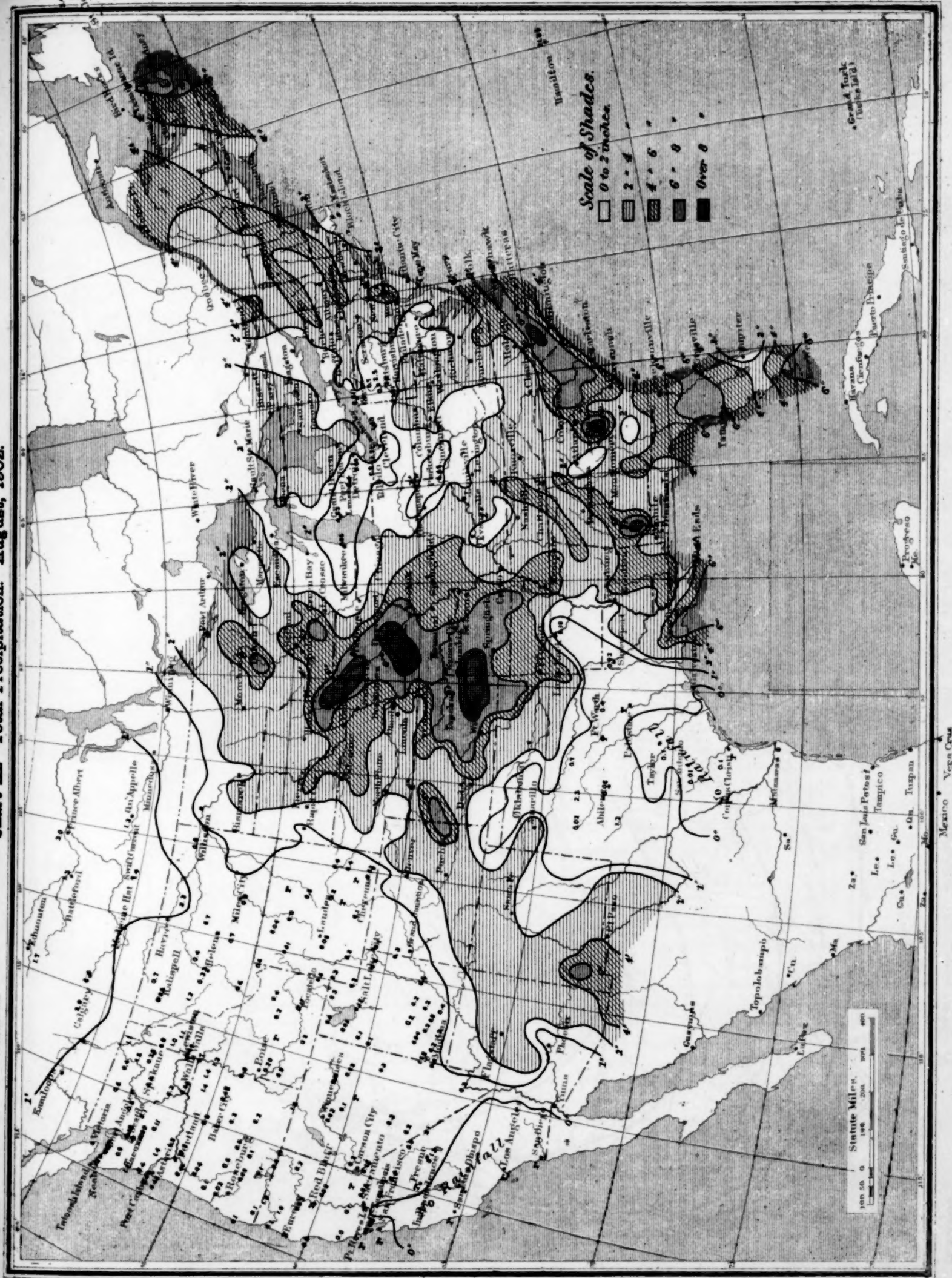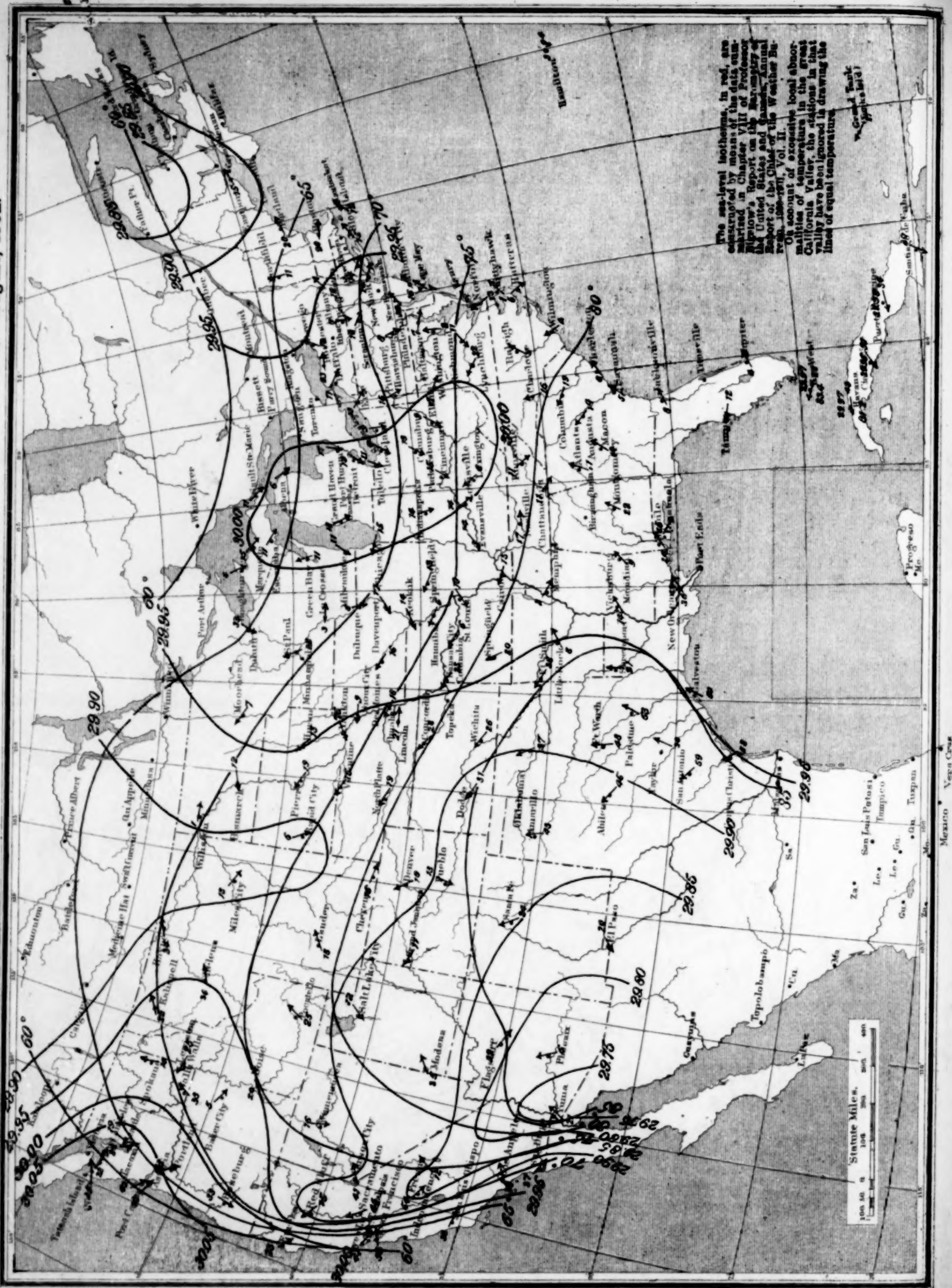**Chart III. Total Precipitation. August, 1902.**

Scale of Shades.

0 to 2 inches.

2 " 4

4 " 6

6 " 8

Over 8

Statute Miles.

• Baskerville Chart IV. Sea-Level Pressure and Temperature; Resultant Surface Winds. August, 1902.

Chart V. Hydrographs for Seven Principal Rivers of the United States. August, 1902.
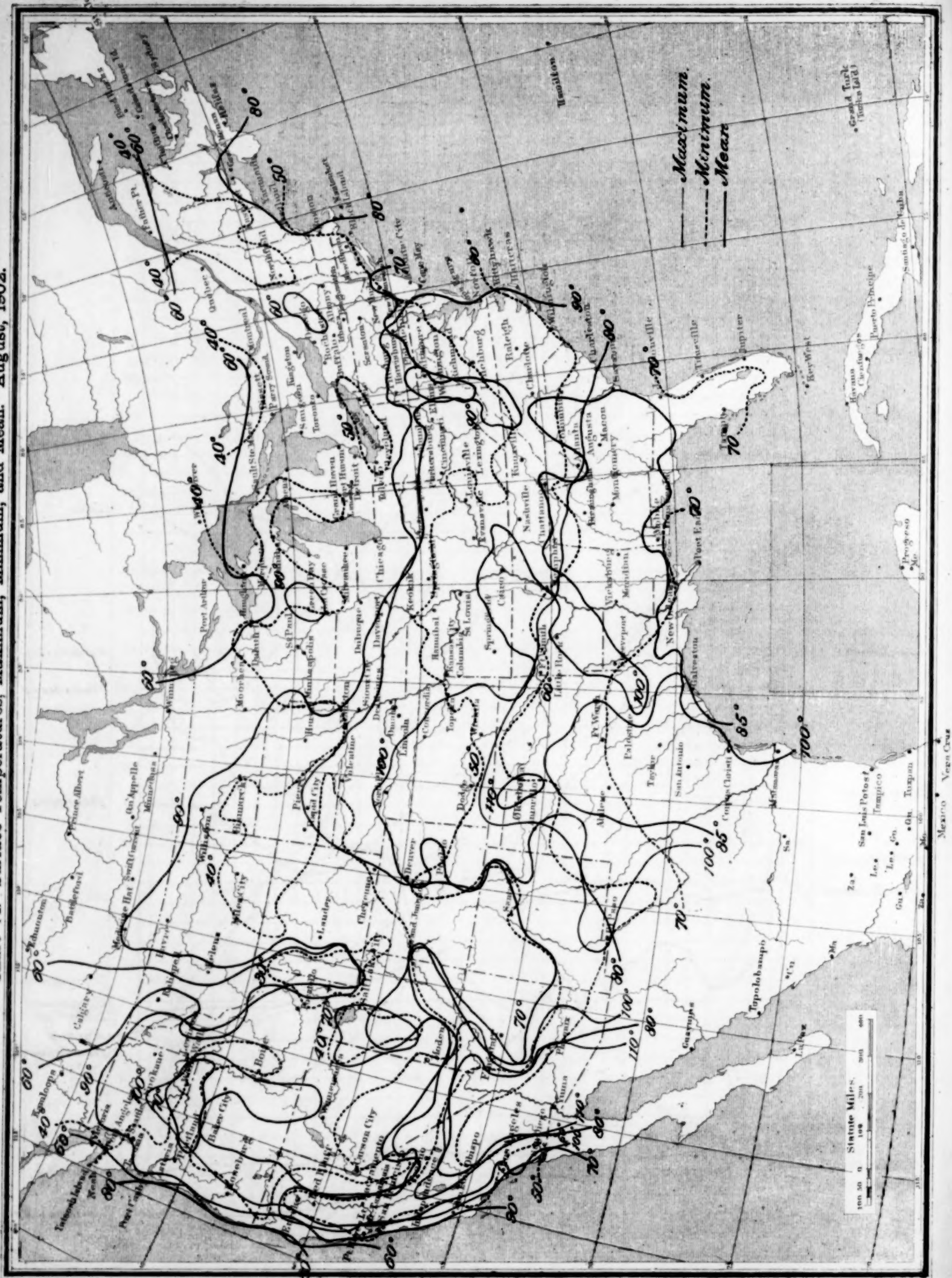
Chart VI. Surface Temperatures; Maximum, Minimum, and Mean. August, 1902.
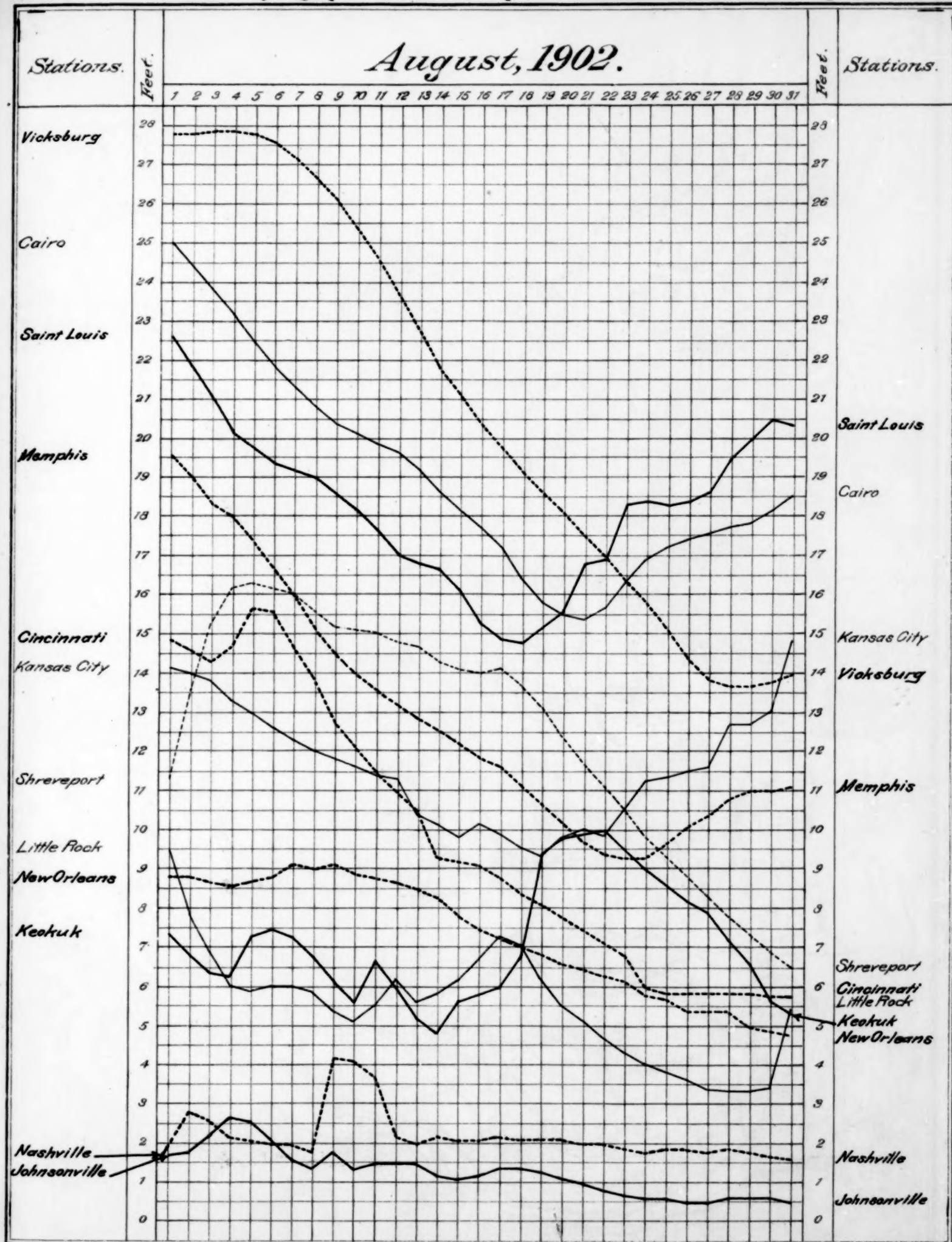
Chart VII. Percentage of Sunshine. August, 1902.

XXX—73.

Scale of Shades.

Over 70 per cent.
60 to 70
50 „ 60
40 „ 50
Under 40

Chart VIII. West Indian Monthly Isobars, Isotherms, and Resultant Winds. August, 1902.